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### **MAINTENANCE INTERVALS**

Operation and Maintenance Manual Excerpt







# Operation and Maintenance Manual

### **D10T Track-Type Tractor**

RJG1-Up (D10T)

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Window Wipers - Inspect/Replace ...... 198 i04038200 Windows - Clean ...... 198 **Maintenance Interval Schedule Every 10 Service Hours or Daily** SMCS Code: 7000 Backup Alarm - Test ...... 128 Ensure that all safety information, warnings and instructions are read and understood before any Cab Filter (Fresh Air) - Clean/Inspect/Replace ... 131 operation or any maintenance procedures are Cooling System Coolant Level - Check ...... 138 performed. Engine Oil Level - Check ...... 147 Fuel Tank Water and Sediment - Drain ...... 167 The user is responsible for the performance of Horn - Test ...... 169 maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement Indicators and Gauges - Test ...... 177 of components due to normal wear and aging. Failure Power Train System Oil Level - Check ...... 183 to adhere to proper maintenance intervals and Pivot Shaft Oil Level - Check ...... 186 procedures may result in diminished performance of Seat Belt - Inspect ...... 191 the product and/or accelerated wear of components. Walk-Around Inspection ...... 196 Use mileage, fuel consumption, service hours, or **Every 50 Service Hours** calendar time, WHICH EVER OCCURS FIRST, Bulldozer Tilt Brace and Tilt Cylinders in order to determine the maintenance intervals. Products that operate in severe operating conditions Lubricate ...... 131 Lift Cylinder Yoke Bearings - Lubricate ...... 178 may require more frequent maintenance. Refer to the Ripper Linkage and Cylinder Bearings maintenance procedure for any other exceptions that may change the maintenance intervals. Lubricate ...... 189 Track Pins - Inspect ...... 195 **Note:** Before each consecutive interval is performed. all maintenance from the previous interval must be **Every 50 Service Hours or Weekly** performed. Cab Filter (Recirculation) - Clean/Inspect/ Replace ...... 132 Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended Initial 250 Service Hours (or at first oil to 3000 hours. S·O·S services may extend the oil change even longer. Consult your Caterpillar dealer change) for details. Power Train Oil Filters - Replace ...... 180 When Required **Every 250 Service Hours** Battery, Battery Cable or Battery Disconnect Switch -Belts - Inspect/Adjust/Replace ...... 129 Replace ...... 128 Engine Oil Sample - Obtain ...... 148 Camera - Clean/Adjust ...... 132 Engine Oil and Filter - Change ...... 149 Cooler Cores and A/C Condenser - Clean ....... 133 Equalizer Bar End Pins Oil Level - Check ......... 153 Cutting Edges and End Bits - Inspect/Replace ... 140 Engine Air Filter Primary and/or Secondary Element -Ladder - Adjust ...... 177 Clean/Replace ...... 141 Track - Check/Adjust ...... 192 Engine Air Precleaner - Clean ...... 143 Equalizer Bar Center Pin - Measure ...... 153 Winch Oil Level - Check ...... 197 Equalizer Bar End Pins - Measure ...... 154 Ether Starting Aid Cylinder - Replace ...... 155 Initial 500 Hours (for New Systems, Refilled Fuel System - Prime ...... 163 Systems, and Converted Systems) Fuses and Circuit Breakers - Replace/Reset ..... 167 High Intensity Discharge Lamp (HID) - Replace .. 168 Cooling System Coolant Sample (Level 2) -Hydraulic System Filter Bypass Screen - Clean .. 171 Obtain ...... 138 Oil Filter - Inspect ...... 178 Electronic Unit Injector - Inspect/Adjust ...... 141 Radiator Core - Clean ...... 187 Engine Valve Lash - Check/Adjust ...... 152 Radiator Pressure Cap - Clean/Replace ............ 187 Engine Valve Rotators - Inspect ...... 152 Ripper Tip and Shank Protector - Inspect/ Replace ...... 190 **Every 500 Service Hours** 

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### **Backup Alarm - Test**

SMCS Code: 7406-081

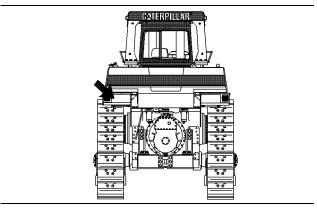


Illustration 157

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The backup alarm is located at the rear of the machine.

Turn the engine start switch to the ON position in order to perform the test.

Apply the service brakes. Move the transmission control lever to the REVERSE position.

The backup alarm should sound immediately. The backup alarm should continue to sound until the transmission control lever is moved to the NEUTRAL position or to the FORWARD position.

The backup alarm has one sound level. The sound level is not adjustable.

i02019456

# Battery, Battery Cable or Battery Disconnect Switch - Replace

**SMCS Code:** 1401-510; 1402-510; 1411-510

- Turn the engine start switch key to the OFF position. Turn all of the switches to the OFF position.
- **2.** Turn the battery disconnect switch to the OFF position. Remove the key.
- **3.** Disconnect the battery cable at the battery disconnect switch. The battery disconnect switch is inside the left engine access door.
- **4.** Disconnect the negative battery cable at the battery.

- **5.** Replace the disconnect switch, the battery cables, or the batteries, as required.
- **6.** Connect the negative battery cable at the battery.
- Connect the negative battery cable at the battery disconnect switch.
- **8.** Install the key and turn the battery disconnect switch to the ON position.

### **Battery Recycle**

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- An authorized battery collection facility
- Recycling facility

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### **Battery - Inspect**

**SMCS Code:** 1401-040

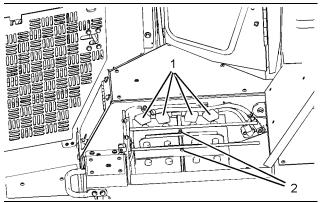


Illustration 158

g01057538

- (1) Terminals and Terminal Covers
- (2) Retainers

**Note:** Perform the following procedures at every 1000 hour interval. Check the following areas more often, as required.

- Open the battery access covers. The battery access covers are on the left and right side of the machine next to the operator compartment.
- **2.** Tighten the battery retainers on all batteries at every 1000 hour interval.

- Clean the top of the batteries with a clean cloth. Keep the terminals clean and coat the terminals with petroleum jelly. Install the terminal covers after you coat the terminals.
- 1. Close the battery access cover.

### Bearing Block Seal - Replace (RJG1-528)

SMCS Code: 1359-510-SA

In order to replace the Seals in the Bearing Block of the Air-To-Air Aftercooler, refer to Disassembly and Assembly, RENR3923-00, "Bearing Block (Fan Drive) - Disassemble" and Disassembly and Assembly, RENR3923-00, "Bearing Block (Fan Drive) - Assemble".

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### Belts - Inspect/Adjust/Replace

SMCS Code: 1357-025; 1357-040; 1357-510

If a new belt is installed, check the belt adjustment after 30 minutes of operation. A belt is considered to be used after 30 minutes of operation.

### **Alternator Belt**

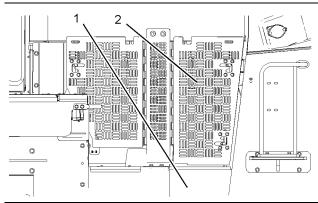


Illustration 159

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**1.** Open the access door (2) and hinged plate (1) on the right side of the engine.

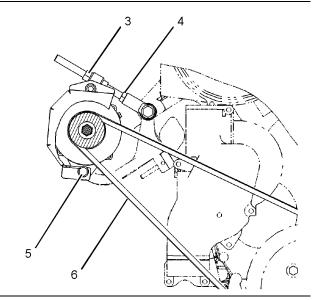


Illustration 160

g01052245

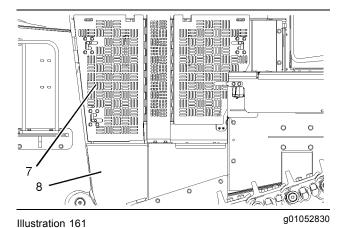
2. Inspect the condition of the belt (6) and the adjustment of the belt. If the belt is cracked or frayed, replace the belt. Use a Kent Moore Company BT-33-97 gauge to check the tension of the alternator belt. Refer to the following table for belt tension.

Table 18

Belt Tension Initial	Belt Tension Used
578 ± 111 N (130 ± 25 lb)	445 ± 44 N (100 ± 9.9 lb)

- **3.** In order to adjust the belt tension, loosen the adjusting locknut (3) and the mounting bolt (5).
- **4.** Turn the nut (4) until the correct tension is reached.
- **5.** Tighten the adjusting locknut and tighten the mounting bolt.
- **6.** Recheck the belt tension. If the amount of tension is incorrect repeat the adjustment procedure.

### Air Conditioner Belt (If Equipped)



**1.** Open the access door (7) and hinged plate (8) on the left side of the engine.

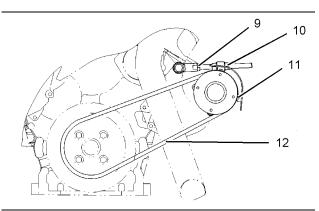


Illustration 162

g01052915

2. Inspect the condition of the belt (12) and the adjustment of the belt. If the belt is cracked or frayed, replace the belt. Use a Kent Moore Company BT-33-97 gauge to check the tension of the alternator belt. Refer to the following table for belt tension.

Table 19

Belt Tension	Belt Tension
Initial	Used
578 ± 111 N (130 ± 25 lb)	445 ± 44 N (100 ± 9.9 lb)

- **3.** In order to adjust the belt tension, loosen the adjusting locknut (10) and the mounting bolt (11).
- **4.** Turn the nut (9) until the correct tension is reached.
- **5.** Tighten the adjusting locknut and tighten the mounting bolt.
- **6.** Recheck the belt tension. If the amount of tension is incorrect repeat the adjustment procedure.

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### **Braking System - Test**

SMCS Code: 4100-081; 4267-081

### **MARNING**

Personal injury can result if the machine moves while testing.

If the machine begins to move during test, reduce the engine speed immediately and engage the parking brake.

Note: The brakes will not hold the machine if you select the "1F" gear position.

Make sure that the area around the machine is clear of personnel and clear of obstacles.

Test the brakes on a dry, level surface.

Fasten the seat belt before you test the brakes.

The following test is used to determine whether the service brake is functional. This test is not intended to determine the maximum brake holding effort. The brake holding effort to hold the brake on this machine will be different. This is because of variations in the engine setting, in the power train efficiency, and in the brake holding ability.

Compare the engine speed at the beginning of machine movement to the engine speed of a prior test. This will be an indication of the amount of system deterioration.

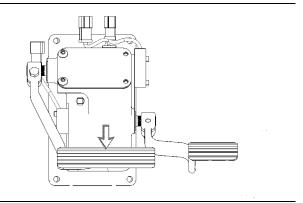


Illustration 163

q01017767

- 1. Start the engine.
- 2. Raise all attachments.
- 3. Depress the brake pedal.
- 4. Release the parking brake switch.

FORWARD position.

- 5. While the brake pedal is depressed, move the directional control lever to the THIRD SPEED
- **6.** Gradually increase the engine speed to full load speed. The machine should not move.
- 7. Move the throttle switch to LOW IDLE. Turn on the parking brake switch. Lower all attachments to the ground. Apply a slight down pressure. Stop the engine.

#### NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the service brake before returning the machine to operation.

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### **Bulldozer Tilt Brace and Tilt Cylinders - Lubricate**

SMCS Code: 5104-086; 6050-086; 6074-086

Lubricate the tilt cylinders and the tilt braces.

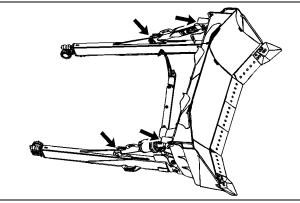


Illustration 164

g02158909

One grease fitting is located at the left front brace assembly or left tilt cylinder (if equipped).

One grease fitting is located at the rod end of the right tilt cylinder.

A grease fitting is located at the cylinder connection to each push arm.

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### Cab Filter (Fresh Air) - Clean/Inspect/Replace

SMCS Code: 7342-040; 7342-070; 7342-510

Note: Clean the filters more often in dusty conditions.

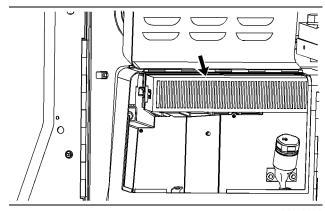


Illustration 165

g01049846

- **1.** Open the access cover to the filter element. The filter cover is on the left side of the machine above the battery compartment.
- 2. The filter element can be cleaned by using pressure air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
- **3.** Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
- 4. Install the filter element.

### **RJG1840-Up**

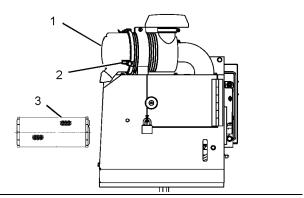


Illustration 166

g01768834

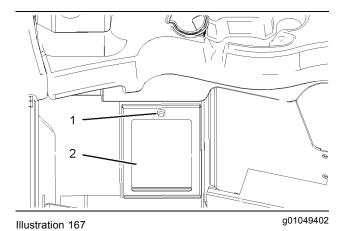
 Loosen three clamps (2) and remove filter cover (1). The filter cover is located outside the left side of the cab.

- 2. Remove filter element (3).
- The filter element can be cleaned by using pressure air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
- **4.** Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
- **5.** Install filter element (3) and install filter cover (1). Close three clamps (2).

### Cab Filter (Recirculation) - Clean/Inspect/Replace

SMCS Code: 7342-040; 7342-070; 7342-510

The recirculation filter is located to the left of the operator's seat.



- 1. Unscrew the bolt (1) in order to remove the filter cover (2). Remove the filter element.
- 2. The filter element can be cleaned by using compressed air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
- 3. Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
- 4. Install the filter element.

Note: Clean the filters more often in dusty conditions.

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### Camera - Clean/Adjust (WAVS (If Equipped))

SMCS Code: 7348

In order to maintain sufficient vision, keep the Work Area Vision System (WAVS) camera lens and the display clean.

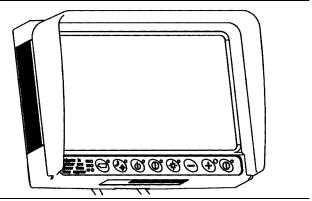


Illustration 168

g01223034

The WAVS display is located in the operator station.

Use a soft, damp cloth in order to clean the display. The display has a soft plastic surface that can be easily damaged by an abrasive material. The display is not sealed. Do not immerse the display with liquid.

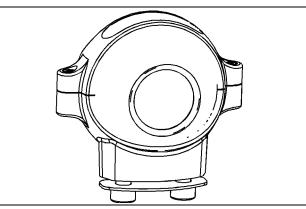


Illustration 169

g01223051

A WAVS camera is located on the rear of the machine, mounted on top of the ROPS, or mounted on the fuel tank.

Use a damp cloth or water spray in order to clean the camera lens. The camera is a sealed unit. The camera is not affected by high pressure spray.

**Note:** The camera is equipped with an internal heater to help counteract the effects of condensation, snow, or ice.

For more information on WAVS, refer to Operation and Maintenance Manual, SEBU8157, "Work Area Vision System".

i02784223

### Cooler Cores and A/C Condenser - Clean

**SMCS Code:** 1064-070; 1353-070; 1374-070; 7320-070

### **Cooler Cores**

The following cooler cores are cooled by the hydraulic fan that is located in the radiator guard at the front of the track-type tractor.

**Aftercooler core** – The aftercooler core cools the inlet manifold air to the engine.

**Radiator core –** The AMOCS radiator cores cool the engine coolant.

**A/C condenser core** – The air conditioning condenser core cools the refrigerant in the air conditioning system.

### Aftercooler RJG1-528

**Note:** The remote air-to-air aftercooler core (RATAAC) that is used on machines RJG1-528 uses a hydraulic fan that is mounted to the bottom of the hood.

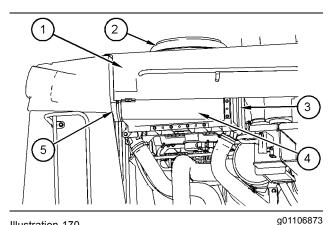


Illustration 170

Left side view of aftercooler RJG1-528

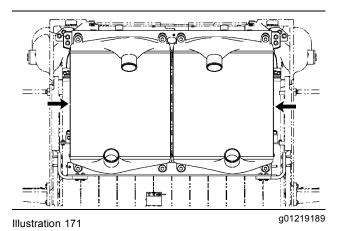
- (1) Hood
- (2) Precleaner
- (3) Aftercooler
- (4) Manifold
- (5) Air duct

### Accessing the Remote Aftercooler Core

1. Remove the manifold.

- **2.** Remove the bolts along the manifold.
- **3.** Unfasten the clamps that attach the air ducts.
- Lift the manifolds off the aftercooler core. Lay the manifolds to the side.
- Remove the bolts from the plates that are on the bottom of the aftercooler.
- 6. Open the plates.
- 7. Inspect the aftercooler.

### Aftercooler RJG529-Up



Rear view of dual aftercooler RJG529-Up

### **Radiator Core**

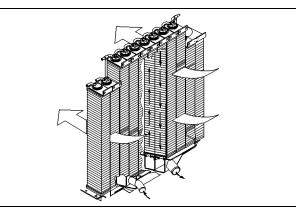
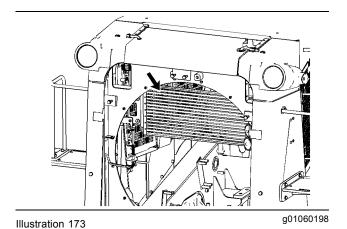


Illustration 172 g00827864

### A/C Condenser Core



A common arrangement for the air conditioner

condenser is located behind the radiator.

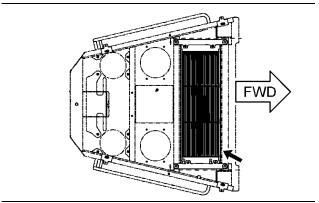


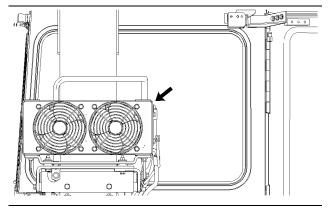
Illustration 174

g01224464

Another arrangement for the air conditioner condenser is located under the hood.

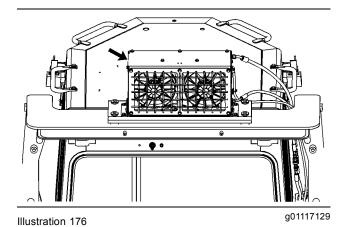
### Remote A/C Condenser Core

In some machine arrangements, the a/c condenser core is remotely located. A remote mounted a/c condenser core is cooled by fans with electric drive.



g01053048 Illustration 175

An optional arrangement for the air conditioner condenser is located on the right side fender.



An optional arrangement for the air conditioner condenser is located on the top of the machine.

### Inspect

Note: Adjust the frequency of inspection according to the effects of the operating environment.

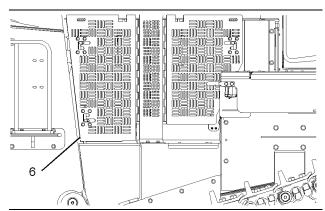


Illustration 177

a01389572

Turn off the engine.

Open both of engine access doors (6).

Inspect the cooling system for the following conditions: coolant leaks, oil leaks, damaged fins, and tubes. Inspect the following parts of the cooling systems: air lines, connections, and clamps for damage .Make repairs for damage, if necessary.

Inspect the hydraulic lines to the RATAAC for chafing and rubbing of the hoses. Replace the hydraulic lines, if necessary.

**Note:** If parts of the aftercooler system may appear to be damaged or if parts of the aftercooler system are repaired, a leak test is highly recommended. Refer to Special Instruction, SEHS8622, "Using the FT1984 Air-to-Air Aftercooler Leak Test Group". The FT-1984 Aftercooler Testing Group can be used for aftercoolers that have hoses with an inside diameter of 102 mm (4.00 inches) or 114 mm (4.50 inches).

For more detailed information on testing and inspection, see Special Publication, SEBD0518, "Know Your Track-Type Tractor Cooling System".

### Replacing the Aftercooler Core in the Top Hood

- Close the plates on the bottom of the aftercooler and attach the bolts.
- Place the manifolds on the aftercooler and attach the bolts.
- **3.** Reattach the air ducts and tighten the clamps.
- **4.** Reattach the access panels.

### Clean

### **WARNING**

Personal injury can result from air pressure.

Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.

Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

Radiator cores, aftercooler cores, and a/c condenser cores needed to be cleaned regularly. Adjust the frequency of cleaning according to the effects of the operating environment.

Blow out the cores with compressed air. Move the air nozzle in a systematic pattern so that the air flow covers the whole core that includes areas in the corner. Clean the middle space between the aftercooler core and the a/c condenser core.

Use a bent copper tube that is approximately 1/4 -3/8 inch diameter as an extension to the air nozzle. This will facilitate cleaning of the middle spaces.

Do not use steam or high pressure water for cleaning frequently. If steam or high pressure water is required to dislodge any debris that is held deep in the cores, make sure that the cleaning is thorough. This may require partial removal or total removal of the air conditioner condenser for better access. Incomplete cleaning with water may cause remaining debris to harden in place. Use lights and wire probes in order to ensure that the cleaning is thorough and complete. If the debris has hardened in the center of the cores, these cores may need to be removed for thorough cleaning.

If you use a degreaser and steam for removal of oil and grease, wash the core with detergent and hot water. Thoroughly rinse the core with clean water. Dry the cores completely before operating the machine in the work mode.

### Dry

If steam or water is used to clean the cores, make sure that the cores are completely dry before the track-type tractor is put back to work.

Use compressed air to blow dry the wet cores, the engine, engine access doors, and the hood.

Close both engine access doors.

If the machine is in a clean environment, start the engine and allow the fan to run until the cooling system has completely dried. Allow the machine to sit overnight before operating the machine in the work mode.

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### Cooling System Coolant (ELC) - Change

SMCS Code: 1395-044

### NOTICE

Make sure you read and understand the information in the topics Safety and Cooling System Specifications for all information pertaining to water, antifreeze and supplemental coolant additive requirements before you proceed with maintenance of the cooling system.

The access door for the cooling system filler cap is located on top of the engine enclosure on the left side.

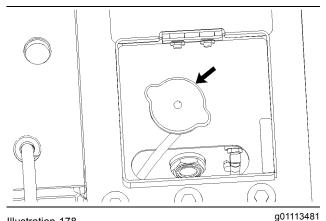
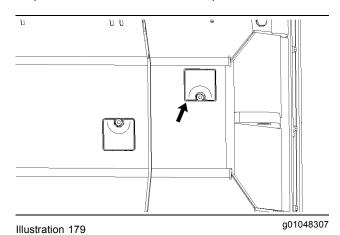


Illustration 178

1. Slowly loosen filler cap in order to relieve system pressure. Remove the filler cap.



2. Remove the access cover for the coolant drain. The cover is located in the front, bottom guard.

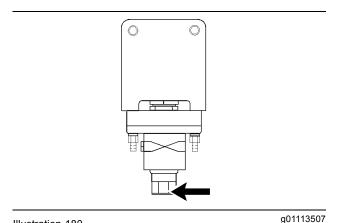


Illustration 180 Bottom view

3. Remove the plug from the drain valve. Install a 12.7 millimeter (.5 inch) pipe into the drain valve. The pipe requires 1/2 - 14 NPTF threads. Clamp a hose to the pipe in order to direct the coolant into a suitable container.

- **4.** Open the drain valve. Allow the coolant to drain into a suitable container.
- **5.** Flush the system with water. Flush the system until the draining water is clear.

**Note:** If the cooling system is already using ELC, cleaning agents are not required to be used at the specified coolant change interval. Cleaning agents are only required if the system has been contaminated by the addition of some other type of coolant or by cooling system damage. Clean water is the only cleaning agent that is required when ELC is drained from the cooling system.

- **6.** Close the drain valve and install the plug.
- **7.** Replace the access cover.
- 8. Add the ELC solution. Refer to Operation and Maintenance Manual, "Capacities - Refill".
- 9. Start the engine. Run the engine without the filler cap until the thermostat opens and the coolant level stabilizes. Check the level of the coolant. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check".
- **10.** If the gasket is damaged, replace the filler cap. Install the filler cap.
- **11.** Stop the engine.

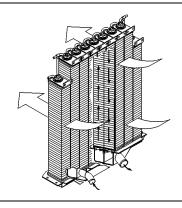


Illustration 181

g00533931

12. Clean the radiator cores with compressed air. You may need to use water in order to remove debris.

For additional information about the coolant, see Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

### Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-044

Table 20

Amount of the Caterpillar Extended Life Coolant Extender by Cooling System Capacity		
Cooling System Capacity	Recommended Amount of Caterpillar Extender	
115 to 163 L (30 to 43 US gal)	3.00 L (100 oz)	

When a Caterpillar Extended Life Coolant (ELC) is used, an extender must be added to the cooling system. See the Operation and Maintenance Manual, "Maintenance Interval Schedule" for the proper service interval. The amount of extender is determined by the cooling system capacity.

For additional information about adding an extender, see Operation and Maintenance Manual, "Model Specific Coolant Information" or consult your Caterpillar dealer.

Use a 8T-5296 Coolant Test Kit to check the concentration of the coolant.

### **⚠** WARNING

Personal injury can result from hot coolant, steam and alkali.

At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.

Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.

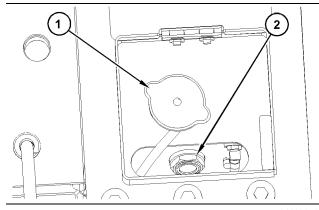


Illustration 182

g01113678

- The access door for the radiator cap and the sight glass for the coolant is located on the top left of the engine enclosure. Loosen the radiator cap (1) slowly in order to relieve pressure. Remove the radiator cap.
- It may be necessary to drain some coolant from the radiator so that Extender can be added to the cooling system.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids in Caterpillar machines.

Dispose of all fluids according to local regulations and mandates.

- Add 3.00 L (100 oz) of Extender to the cooling system.
- **4.** Observe the sight glass (2) in order to verify the level of coolant. If the coolant level is at the middle of the sight glass, the coolant level is correct. If the coolant level is below the middle of the sight glass, the coolant level is low.
- **5.** Replace the radiator cap if the cap gasket is damaged. Install the radiator cap.

### Cooling System Coolant Level - Check

SMCS Code: 1353-535-FLV; 1395-535-FLV

### **⚠** WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the fill cap is cool enough to touch with your bare hand.

Remove the fill cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

The access door for the radiator cap and the sight glass for the coolant is located on the top left of the engine enclosure.

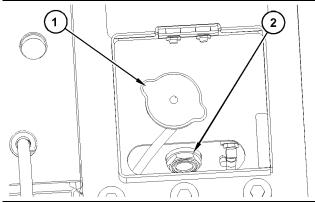


Illustration 183

g01113678

- Observe the sight glass (2) in order to verify the level of the coolant. If the coolant is above the middle of the sight glass, the coolant level is correct. If the coolant level is below the middle of the sight glass, the coolant level is low.
- 2. If it is necessary to add coolant, remove the radiator cap (1) slowly in order to relieve the pressure.
- 3. Inspect the radiator cap and the radiator cap seal for debris, for foreign material, or for damage. Clean the radiator cap with a clean cloth. Replace the radiator cap if the radiator cap is damaged.
- 4. Install the radiator cap.

**5.** Inspect the radiator core for debris. Clean the radiator core, if necessary.

Use compressed air, high pressure water, or steam to remove dust and debris from the radiator core. However, the use of compressed air is preferred.

i02319439

### Cooling System Coolant Sample (Level 2) - Obtain

SMCS Code: 1350-008; 1395-008; 1395-554; 7542

### Level 2 Analysis

#### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Testing the coolant can be done at your Caterpillar dealer. Caterpillar S·O·S Coolant Analysis is the best way to monitor the condition of your coolant and your cooling system. S·O·S Coolant Analysis is a program that is based on periodic samples. See Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluid Recommendations", "S.O.S Coolant Analysis" for more information.

Perform a Coolant Analysis (Level 2) at the initial 500 hours. Perform the analysis yearly after the initial 500 hours.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the shipping sleeve immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.
- 1. Park the machine on a hard, level surface. Set the engine at low idle speed.

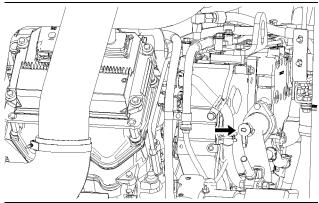


Illustration 184 RJG1-528

g01048147

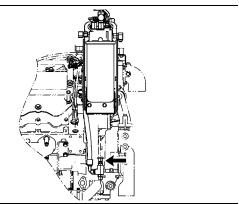


Illustration 185 RJG529-Up Right side view g01218874

- **2.** The sampling valve for the coolant is located on the right side of the engine. Remove the protective cap from the sampling valve.
- 3. Use a 169-8373 Fluid Sampling Bottle in order to obtain a sample.
- **4.** Replace the protective cap.

Submit the sample for Level 2 analysis.

i02050545

### **Cooling System Water** Temperature Regulator -Replace

**SMCS Code:** 1355-510

Replace the temperature regulators on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system.

The temperature regulators should be replaced after the cooling system has been cleaned. Replace the temperature regulators while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the regulator housing.

#### NOTICE

Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

### NOTICE

Replace the thermostat on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system.

A new thermostat should be installed after the cooling system has been cleaned. Install the thermostat while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

### **MARNING**

Personal injury can result from hot coolant, steam and alkali.

At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.

Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.

Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.

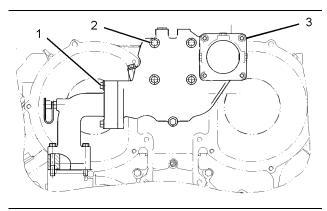


Illustration 186

g01051918

- **1.** The housing for the temperature regulators is located on the front of the engine.
- **2.** Remove the bolts (1) and (3) from the elbows. Remove the elbows.
- **3.** Remove the bolts (2) from the temperature regulator housing.
- **4.** Remove the two temperature regulators and the seals.

### NOTICE

Since Caterpillar engines incorporate a shunt design cooling system, it is mandatory to always operate the engine with a thermostat.

Depending on load, failure to operate with a thermostat could result in either an overheating or an overcooling condition.

### **NOTICE**

If the thermostat is installed incorrectly, it will cause the engine to overheat.

- 5. Install new seals and install new temperature regulators. Install a new housing gasket.
- **6.** Install the regulator housing and install the elbows.

i03204387

### Cutting Edges and End Bits - Inspect/Replace

**SMCS Code:** 6801-040; 6801-510; 6804-040; 6804-510

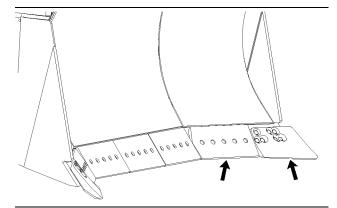


Illustration 187

g01051836

- Raise the bulldozer blade and block up the bulldozer blade. When you remove the cutting edges and the end bits, maintain the bulldozer blade at a minimum height.
- 2. Remove the bolts. Then remove the cutting edge and the end bits.
- 3. Thoroughly clean all contact surfaces.
- **4.** Inspect the opposite side of the cutting edge. If the opposite side of the cutting edge is not worn, turn the opposite side of the cutting edge outward and install the cutting edge.
- **5.** If both sides of the cutting edge are worn, install a new cutting edge section.

**Note:** When the cutting edge is within 10 mm (0.4 inch) of the bottom of the support, change the cutting edge. **Do not allow wear to occur on the support.** 

**6.** If the bottom edge or the outside edge of the end bit is worn, install a new end bit.

**Note:** When the end bit is within 10 mm (0.4 inch) of the bottom of the support, change the end bit. When the end bit is within 10 mm (0.4 inch) of the outside edge of the support, change the end bit. **Do not allow any wear to occur on the support.** 

Install all bolts and tighten the bolts to the specified torque.

**Reference:** For more information, refer to Specifications, "Torque Specifications".

- **8.** Raise the bulldozer blade and remove the blocking. Lower the bulldozer blade to the ground.
- **9.** After you operate the machine for a few hours, check all bolts for the proper torque.

i02061807

### Electronic Unit Injector - Inspect/Adjust

SMCS Code: 1290-025; 1290-040

### **WARNING**

The Electronic Control module produces high voltage. To prevent personal injury make sure the Electronic Control Module is not powered and the unit injector solenoids are disconnected.

#### NOTICE

The camshafts must be correctly timed with the crankshaft before an adjustment of the unit injector lash is made. The timing pins must be removed from the camshafts before the crankshaft is turned or damage to the cylinder block will be the result.

The operation of Caterpillar engines with improper adjustments of the electronic unit injector can reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

Adjust the electronic unit injector at the same interval as the valve lash adjustment.

Refer to your machine's Service Manual or your Caterpillar dealer for the complete adjustment procedure.

i03619440

# Engine Air Filter Primary and/or Secondary Element - Clean/Replace

**SMCS Code:** 1054-070-SE; 1054-070-PY;

1054-510-SE; 1054-510-PY

### **Primary Filter**

#### NOTICE

Service the primary filter element only when the alert indicator for the intake air filter is flashing. Do not open the filter compartment unless it is time for service. Opening the filter compartment can cause dirt to get into the clean side of the filter housing.

### NOTICE

Extremely short air filter life can result if the precleaner system malfunctions. If air filter life is drastically reduced from typical for the operating conditions, consult your Caterpillar Dealer. The exhaust system dust ejector for the strata tube precleaner must pull a minimum vacuum of 508 mm (20 inch) of water.

#### NOTICE

Service the engine air filters with the engine stopped. Engine damage could result.

### NOTICE

Always leave the secondary filter element in place while you clean the primary element, or while you clean the air cleaner housing.

#### NOTICE

Do not use the filter for longer than one year.

 Open the engine compartment's access door, if equipped.

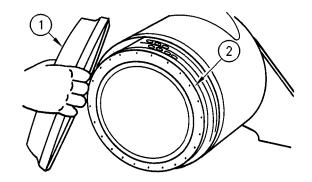


Illustration 188 g00470852

- 2. Remove the air cleaner cover (1). Pull out in order to remove the element.
- **3.** Remove the primary filter element (2) from the air cleaner housing.
- 4. Mark the secondary filter element in order to show that the primary filter element has been serviced. The secondary filter element should be replaced when the primary filter element is serviced for the third time. Refer to the section "Secondary Filter".

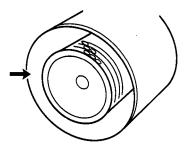


Illustration 189

g00470857

- Clean the inside of the air cleaner housing. Keep the secondary filter element in place while you clean the housing.
- **6.** If the primary filter element has not been cleaned six times, inspect the primary filter element. If the primary filter element has been cleaned six times, replace the primary filter element. Proceed to Step 9.
- 7. Inspect the primary filter element. Inspect the filter element for holes and for tears by looking through the filter element. Look toward a bright light. Inspect the element for damaged gaskets or for dented metal parts. Replace damaged filters. Always crush damaged filter elements. Properly discard the filter elements. If you replace the primary filter element, proceed to step 9.
- 8. If the primary filter element is not damaged and the element has not been previously cleaned six times, clean the element. The filter element can be cleaned by using pressure air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side. In order to show that the filter element has been cleaned, mark the element. The primary filter element can be cleaned up to six times.

### **NOTICE**

Do not clean the filter elements by bumping or tapping them. Do not use filter elements with damaged pleats, gaskets, or seals. Do not wash the filter elements.

- **9.** Push the filter element firmly in order to properly seat the element. Write the date on the element, if the primary element is replaced.
- 10. Install the air cleaner cover.
- **11.** Close the access door, if equipped.

### **Secondary Filter**

#### NOTICE

Always replace the secondary filter element. Never attempt to reuse it by cleaning.

The secondary filter element should be replaced at the time the primary element is serviced for the third time.

The secondary filter element should also be replaced if the yellow piston in the filter element indicator enters the red zone after installation of a clean primary element, or if the exhaust smoke is still black.

#### NOTICE

The filter should be kept in service for no longer than one year.

### **NOTICE**

Always leave the secondary filter element in place while you clean the air cleaner housing.

- 1. Open the engine access door, if equipped.
- 2. Remove the air cleaner housing cover.
- **3.** Remove the primary filter element. Refer to the section "Primary Filter".
- **4.** Clean the inside of the air cleaner housing.

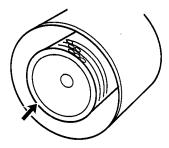


Illustration 190

g00470240

Remove the secondary filter element. Pull out in order to remove the element.

- **6.** Install a new secondary filter element. Push the element firmly in order to properly seat the element. Write the date on the element, if the element is replaced.
- 7. Install the primary filter element and the air cleaner housing cover.
- 8. Close the engine access door, if equipped.

### **Engine Air Precleaner - Clean**

SMCS Code: 1050-070; 1055-070

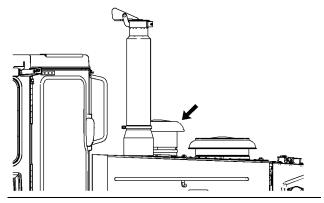


Illustration 191

g01053125

Inspect the air inlet screen for dirt and for trash.

- **1.** Remove the screen. Clean the screen if the screen is dirty.
- 2. Inspect the precleaner tube for dirt and for dust.
- **3.** Clean the precleaner tube with pressure air if the precleaner tube is dirty.

### NOTICE

Service the air cleaner only with the engine stopped. Engine damage could result.

Run the engine at high idle. If the engine air filter indicator still flashes, service the air filter. Stop the engine.

i02781929

### **Engine Crankcase Breather - Clean**

**SMCS Code:** 1317-070

The crankcase breathers are located on the top of the engine.

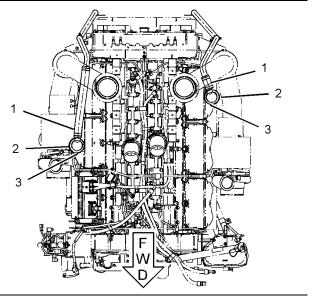


Illustration 192 Top view g01389603

1. Remove hose (1) from the outlet of the breather (2) on each side of the engine.

**Note:** Perform steps 2 through 8 on each crankcase breather.

- 2. Remove bolts (3) at the base of the breather (not shown). Remove the breather from the engine.
- **3.** Check the condition of the seal. Replace the seal if the seal is damaged.
- Remove the breather element. Wash the breather element and the breather in a clean nonflammable solvent.
- **5.** Shake the breather element until the breather element is dry. You may also use pressure air to dry the breather element.
- **6.** Check the condition of the hose. Replace the hose if the hose is damaged.
- Install the element into the breather and install the breather.
- **8.** Install the hose onto the outlet of the breather cover and tighten the clamp.

### **Engine Mounts and Crankshaft Vibration Damper - Inspect**

SMCS Code: 1152-040; 1205-040

Damage to the vibration damper or failure of the vibration damper will increase torsional vibrations. These vibrations will result in damage to the crankshaft and in damage to the other engine components. A deteriorating vibration damper will cause excessive gear train noise at variable points in the speed range.

See the Service Manual, "Engine Disassembly and Assembly" for the procedure to install a new damper.

Caterpillar recommends replacing the damper for any of the following reasons:

 The engine has had a failure because of a broken crankshaft.

The damper can be used again if none of the above conditions are found. The damper can be used if the damper is not damaged.

In the damper, a wobble can occur on the outer ring. Some of the wobble of the outer ring is normal. If a wobble is present, replacement of the damper is not necessary. You can confirm an acceptable wobble by seeing the Service Manual, "Engine Disassembly and Assembly" for the procedure to check the damper.

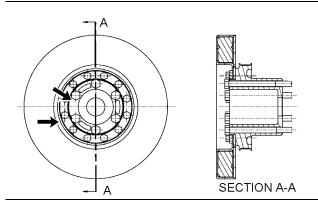


Illustration 193

g01066628

Marks of the damper are on the hub and on the ring. These marks will indicate the condition of the vibration damper. If the marks are not in alignment, the rubber seal between the ring and the hub has separated from the ring and/or from the hub. Install a new damper if the marks are not in alignment.

**Note:** Refer to the Service Manual, "Engine Disassembly and Assembly" for the necessary replacement procedure.

Caterpillar recommends checking the engine mounts for deterioration. This will prevent excessive engine vibration that is caused from improper mounting.

i02195435

### **Engine Mounts and Equalizer Bar - Inspect**

SMCS Code: 1152-040; 7206-040

### **Engine Mounts**

Caterpillar recommends checking the engine mounts for deterioration. This will prevent excessive engine vibration that is caused from improper mounting.

### **Equalizer Bar End Pins**

### **WARNING**

Personal injury or death can occur from not following the proper procedure or the recommended tooling.

To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

### **WARNING**

Personal injury or death can occur from not following the proper procedure or the recommended tooling.

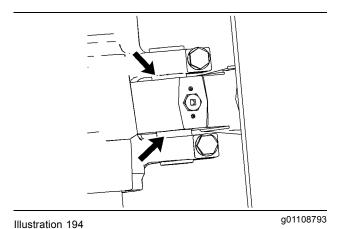
To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

To check the equalizer bar end pin for movement and unusual wear, perform the following steps.



- Clean the areas that are around the end pin with a high pressure wash. Inspect the condition of the seal.
- **2.** Check the area for oil leakage and a neutral seal position.
- 3. Check the oil in both end pin joints.

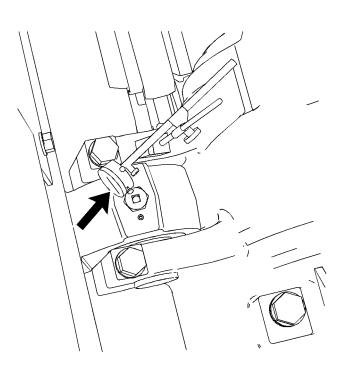


Illustration 195 g01108795

4. Position a dial indicator on the bracket for the pin on the roller frame. Set the dial indicator probe on top of the equalizer bar. Set the dial indicator to zero.

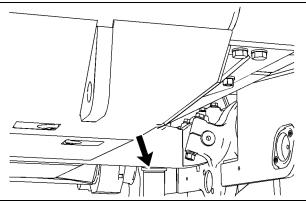


Illustration 196

g01108798

- Put a 55 ton hydraulic jack in position under the end of the equalizer bar.
- Jack up the equalizer bar and take a reading on the dial indicator in order to determine the amount of wear.

Note: Schedule the end pin joint for repair if the reading on the dial indicator exceeds 1.50 mm (.059 inch).

Repeat the inspection and the measurement procedure for the other end of the equalizer bar and end pin.

Consult your Caterpillar dealer for an inspection and for repair instructions.

### **Equalizer Bar Center Pin**

### **A WARNING**

Personal injury or death can occur from not following the proper procedure or the recommended tooling.

To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

### **MARNING**

Personal injury or death can occur from not following the proper procedure or the recommended tooling.

To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

To check the equalizer bar center pin for looseness and for unusual wear, perform the following steps.

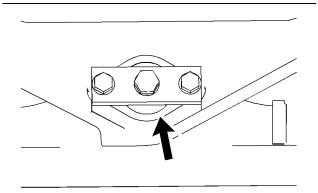


Illustration 197

g01108801

**1.** Clean the areas that are around the center pin and equalizer bar.

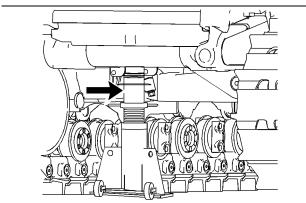


Illustration 198

a01108803

2. Put a 55 ton hydraulic jack in position under the main frame, as shown.

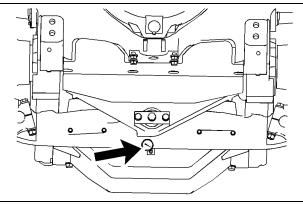


Illustration 199

g01108804

- Position a dial indicator on the equalizer bar and place the probe of the dial indicator under the center of the frame for the pin. Set the dial indicator to zero.
- Jack up the front of the machine until the weight of the roller frames are supported by the equalizer bar.
- Take a reading of the dial indicator in order to determine the amount of wear on the pin and bearing.

Note: Schedule the center pin joint for repair if movement exceeds 2.54 mm (.100 inch).

Consult your Caterpillar dealer for an inspection and for repair instructions.

### **Equalizer Bar Pads**

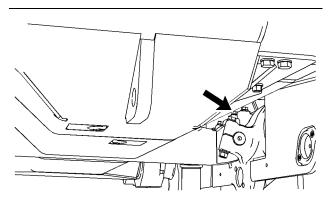


Illustration 200

g01108806

The equalizer bar pads are under the front guard, which is underneath the machine. Inspect the equalizer bar pads for cracked rubber and for missing portions of rubber. Consult your Caterpillar dealer for replacement parts and for replacement instructions.

### **Engine Oil Level - Check**

SMCS Code: 1302-535-FLV; 1326-535-FLV

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin

#### NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

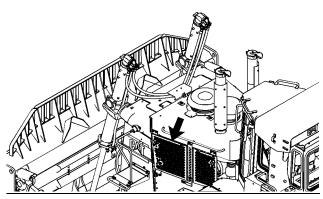


Illustration 201

 Open the access cover on the left side of the machine.

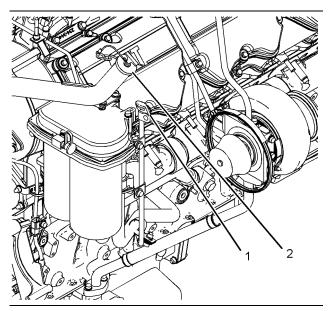


Illustration 202 g01218549

**Note:** Your machine is equipped with one of the two dipsticks that are shown.

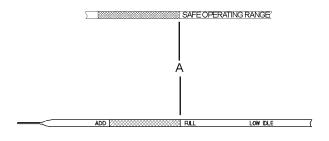


Illustration 203 g01223388

(A) Full mark at the engine running position("LOW IDLE")

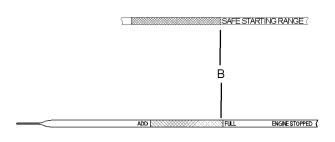


Illustration 204 g01218685

(B) Full mark with cold engine oil ("ENGINE STOPPED")

2. Check the "SAFE OPERATING RANGE" side or the "LOW IDLE" side of dipstick (1) while the engine is running at low idle. The oil should be at operating temperature. Maintain the oil level to the "FULL" mark.

Check the "SAFE STARTING RANGE" side or the "ENGINE STOPPED" side of dipstick (1) before starting the engine when the engine oil is cold. Maintain the oil level to the "FULL" mark.

**Note:** When you operate the machine on severe slopes, the oil level in the engine crankcase must be in the "SAFE OPERATING RANGE" zone or "LOW IDLE" zone of the dipstick.

- 3. Remove oil filler cap (2). If necessary, add oil.
- 4. Clean the oil filler cap and install the oil filler cap.
- 5. Close the access cover.

### **Engine Oil Sample - Obtain**

SMCS Code: 1000-008; 7542-008

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Obtain the sample of the engine oil as close as possible to the recommended sampling interval. The sampling interval may vary for some S·O·S oil analysis programs. In order to receive the full effect of S·O·S oil analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

Supplies for collecting samples can be obtained from your Caterpillar dealer. These supplies include the following: probes, probe holders, tubing, and sampling bottles.

Use the following guidelines for proper oil sampling:

- Always take samples when the machine is at operating temperature and the oil has had time in order to circulate through the oil system.
- Always drain about 100 mL (4 oz) of oil into a container before you take the sample. This will flush the sampling valve.
- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.

- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from the drain for a system, a pan of used oil or a used filter.
- **1.** Operate the machine until the machine reaches operating temperature.
- **2.** Set the engine at low idle.
- 3. Open the access cover (if equipped) that is on the left side of the machine.

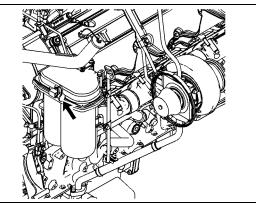


Illustration 205

g01223047

- **4.** Clean the area around the sampling valve and the protective cap in order to avoid contamination of the sample. Remove the protective cap.
- **5.** Flush the sampling valve. Insert the probe into the sampling valve. Collect about 100 mL (4 oz) of oil into a container. This will flush the sampling valve. Remove the probe.

**Note:** It may be necessary to increase the engine RPM if the oil flow is too slow at low idle.

- 6. Collect the sample. Do not allow dirt or other contaminants to enter the sampling bottle. Insert the probe into the sampling valve and fill the sampling bottle three-fourths from the top. Do not fill the bottle completely.
- 7. Remove the probe from the sampling valve. Put the cap securely on the sampling bottle. Place the sampling bottle with the completed label into the mailing tube.
- 8. Replace the protective cap on the sampling valve.
- **9.** Close the access cover (if equipped).

### **Engine Oil and Filter - Change**

SMCS Code: 1308-510; 1318-510

### Selection of the Oil Change Interval

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

#### NOTICE

This machine is equipped with an engine that meets EPA Tier 3, Euro Stage III, or MOC Step 3 emission regulations. A 500 hour engine oil change interval is available, provided that operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S·O·S oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

CAT oil filters are recommended.

Recommended multigrade oil types are listed in Table 21.

### Note: Do not use API CF-4 oils in Caterpillar machine diesel engines.

Abnormally harsh operating cycles or harsh environments can shorten the service life of the engine oil. Arctic temperatures, corrosive environments, or extremely dusty conditions may require a reduction in engine oil change intervals from the recommendations in Table 21. Also refer to Manual, SEBU5898, "Cold Weather Recommendations for all Caterpillar Machines". Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. See your Cat dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Table 21

	D10T Series Engine Oil Change Interval <sup>(1)</sup>				
		Operating Conditions			
				Severe	
	Multigrade Oil Type	Normal <sup>(2)</sup>	High Load Factor <sup>(3)</sup>	Fuel Sulfur above 0.3%	Altitude above 1830 m (6000 ft)
	Cat DEO Preferred	500 hr	500 hr	250 hr	250 hr <sup>(6)</sup>
	ECF-2 Preferred	500 hr	500 hr	250 hr	250 hr <sup>(6)</sup>
	ECF-1-a	250 hr	250 hr	150 hr <sup>(5)</sup>	250 hr <sup>(6)</sup>

- (1) The traditional oil change interval for engines is 250 hours. The standard oil change interval in this machine is 500 hours, if the operating conditions and recommended oil types that are listed in this table are met. Improvements in the engine allow this engine oil change interval. This new standard interval is not permitted for other machines. Refer to the applicable Operation and Maintenance Manuals for the other machines.
- (2) Normal conditions include these factors: Fuel sulfur below 0.3%, altitude below 1830 m (6000 ft), and good air filter and fuel filter maintenance. Normal conditions do not include high load factor, harsh operating cycles, or harsh environments.
- (3) Load factors are defined as a function of fuel consumption rate. High load factors can shorten the service life of your engine oil. Continuous heavy load cycles and very little idle time result in increased fuel consumption and oil contamination. These factors deplete the oil additives more rapidly. If the average fuel consumption of your D10T exceeds 76 L (20.1 US gal) per hour, follow the "High Load Factor" recommendations in Table 21. To determine average fuel consumption, measure average fuel consumption for a period of 50 to 100 hours. If the application of the machine is changed, the average fuel consumption may change.
- (4) For sulfur content above 0.1%, refer to this topic in the Manual, SEBU6250.
- (5) In order to verify an oil change interval of 500 hours, refer to "Program A" below.
- (6) Use "Program B" below to determine an appropriate interval.

### Adjustment of the Oil Change Interval

**Note:** Your Cat dealer has additional information on these programs.

### Program A

Verification for an Oil Change Interval of 500 Hours

This program consists of three oil change intervals of 500 hours. Oil sampling and analysis is done at 250 hours and 500 hours for each of the three intervals for a total of six oil samples. The analysis includes oil viscosity and infrared (IR) analysis of the oil. If all of the results are satisfactory, the 500 hour oil change interval is acceptable for the machine in that application. Repeat Program A if you change the application of the machine.

If a sample does not pass the oil analysis, take one of these actions:

- Shorten the oil change interval to 250 hours.
- Proceed to Program B.
- Change to a preferred oil type in Table 21.

### **Program B**

Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each interval is adjusted an additional 50 hours. Periodic oil sampling and analysis is done during each interval. The analysis includes oil viscosity and infrared (IR) analysis of the oil. Repeat Program B if you change the application of the machine.

If an oil sample does not pass the analysis, shorten the oil change interval, or change to a preferred multigrade oil type in the listing above.

#### References

Reference: Form, PEDP7035, "Optimizing Oil

Change Intervals"

Reference: Form, PEDP7036, "S·O·S Fluid Analysis"

Reference: Form, PEHP7076, "Understanding the

S·O·S Oil Analysis Tests"

### Procedure for Changing the Engine Oil and Filter

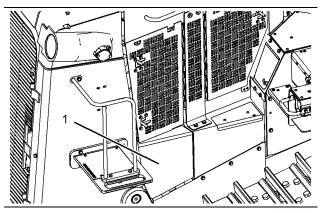


Illustration 206

g01051084

 Open the engine access door on the left side of the machine.

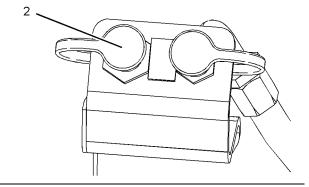


Illustration 207

g01047383

If the machine is equipped with a high speed oil change arrangement, use a nozzle assembly in order to drain the oil from the crankcase.

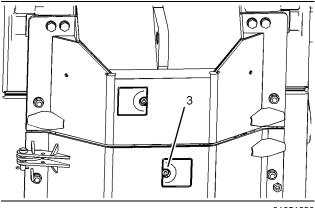


Illustration 208

g01051220

The access cover for the crankcase drain is located in the belly guard underneath the front of the machine. Remove the bolt in order to remove the access cover.

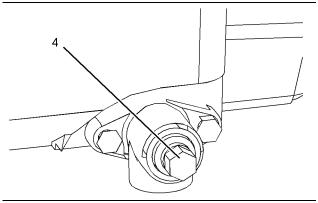


Illustration 209 g01047321

- **4.** Open the crankcase drain valve. Allow the oil to drain into a suitable container. A drain hose may be attached to the crankcase drain valve in order to aid the draining of the oil.
- 5. When the oil has been completely drained from the crankcase, close the crankcase drain valve. Close the crankcase drain access cover.

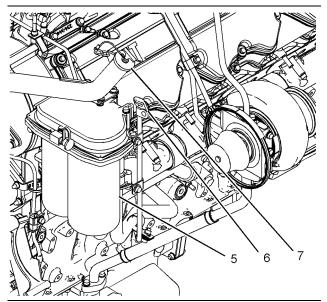


Illustration 210

g01222997

- **6.** Remove the crankcase oil filter elements (5) and discard the crankcase oil filter elements properly. Make sure that all of the old filter seals are removed from the filter base.
- Apply a thin film of clean engine oil to the sealing surface of the new filter element.
- **8.** Install the new oil filter elements by hand.

Instructions for the installation of the filters are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

- 9. Install the crankcase drain plug.
- 10. Remove oil filler cap (7). Fill the crankcase with new oil. See Operation and Maintenance Manual, "Capacities (Refill)". Clean the oil filler cap and install the oil filler cap.
- Always measure the oil level with dipstick (6) in order to ensure that the correct amount of oil was added.
- 12. Start the engine in order to warm the oil.

**Note:** Your machine is equipped with one of the two dipsticks that are shown.

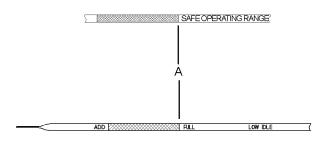


Illustration 211

g01223388

- (A) Full mark at the engine running position ("LOW IDLE")
- 13. Check the "SAFE OPERATING RANGE" side or the "LOW IDLE" side of the dipstick while the engine is running. The oil should be at operating temperature. Maintain the oil level in the "SAFE OPERATING RANGE" or the "LOW IDLE" range.
- **14.** Close the engine access door on the left side of the machine.

### Engine Valve Lash - Check/Adjust

SMCS Code: 1102-025

### **WARNING**

To prevent possible injury, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

### **MARNING**

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

#### NOTICE

Operation of Caterpillar engines with improper valve adjustments will reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

### **NOTICE**

Measure the valve clearance with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the valves to cool to engine cylinder head and engine block temperature.

Check the valve bridge before setting the valve lash. Ensure that the valve bridge is seated equally on both valve stems.

Refer to your machine's Service Manual or your Caterpillar dealer for the complete valve adjustment procedure.

i02092057

### **Engine Valve Rotators - Inspect**

**SMCS Code:** 1109-040

### WARNING

When inspecting the valve rotators, protective glasses or face shield and protective clothing must be worn, to prevent being burned by hot oil or spray.

### **A** WARNING

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

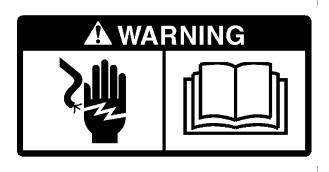


Illustration 212

q00941949

1. Start the engine. Run the engine at low idle.

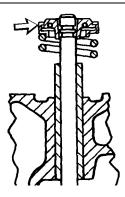


Illustration 213

g00038585

- 2. Watch the top surface of each valve rotator. Whenever an inlet valve closes or an exhaust valve closes, each valve rotator should turn.
- **3.** If a valve rotator fails to rotate, consult your Caterpillar dealer for service.

**Note:** Caterpillar recommends replacing valve rotators that are operating improperly. An improperly operating valve rotator will shorten valve life because of accelerated wear on the valves.

**Note:** If a damaged valve rotator is not replaced, some valve face guttering could result. Metal particles from the valve could fall into the cylinder. This could cause damage to the piston head and to the cylinder head.

### **Equalizer Bar Center Pin - Measure**

**SMCS Code:** 7206-082

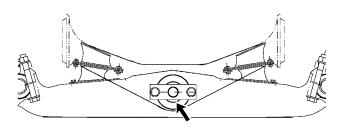


Illustration 214 Rear view g01066674

To check the equalizer bar center pin for looseness and for unusual wear, perform the following steps.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

**1.** Clean the areas that are around the center pin with a high pressure wash.

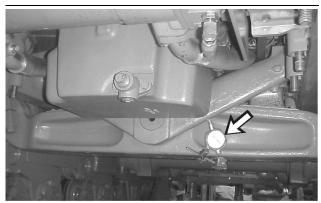


Illustration 215 Front view g00736127

2. Install a dial indicator and measure the vertical play in the center pin joint.

Note: Schedule the center pin joint for repair if movement exceeds 2.54 mm (.100 inch).

Consult your Caterpillar dealer for an inspection and for repair instructions.

i02827491

### Equalizer Bar End Pins Oil Level - Check (Waste Handling Arrangement)

**SMCS Code:** 7206-535-FLV

**Note:** If your machine is equipped with this arrangement, perform this procedure every 250 service hours.



Illustration 216 7H-1680 Lubrication Pump

g00519704

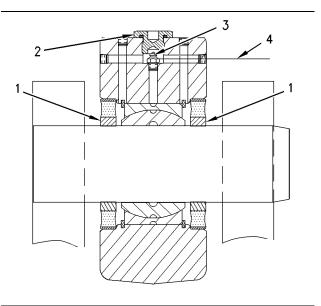


Illustration 217

g00304125

Equalizer bar end pin for (S/N: 3KR617-Up) machines

- 1. Clean the area that surrounds the end pin with a high pressure washer. Inspect the condition of seal (1).
- **2.** Check the area around the seal for oil leakage. Check the seal for a neutral seal position.
- 3. Remove plug (2).

- 4. Apply the gear oil through fitting (3). Fill with gear oil until the gear oil reaches oil level (4) at the top of the hex head on the fitting. Remove any excess oil. This will maintain a volume of air. Refer to Caterpillar Machine Fluids Recommendation, SEBU6250 for the appropriate oil viscosity that is suited to the ambient air temperature. The gear oil must be applied with a 7H-1680 Lubrication Pump or a suitable grease gun. Use SAE 90 API GL-5 gear oil, 85W90 API GL-5 gear oil, 80W90 API GL-5 gear oil, or 75W90 API GL-5 gear oil. The gear oil has excellent load carrying capacity.
- 5. Install plug (2).

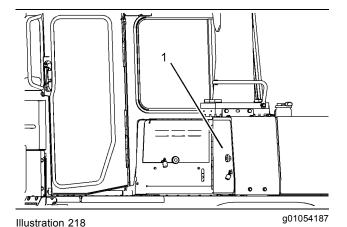
Note: THE USE OF GREASE (MPGM) IS ONLY ALLOWED FOR A FAILED SEAL. THE SEAL SHOULD BE REPLACED AS SOON AS POSSIBLE. THE COMBINATION OF GEAR OIL AND MPGM IS NOT HARMFUL TO THE MACHINE.

i02827490

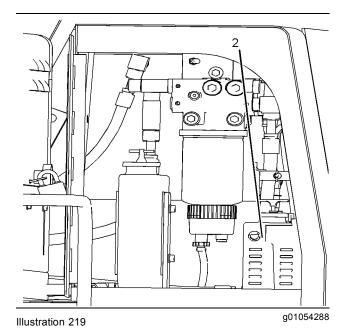
### Equalizer Bar End Pins Oil Level - Check (If Equipped)

SMCS Code: 7206-535-FLV

**Note:** If your machine is equipped with this arrangement, perform this procedure every 10 service hours or daily, which ever occurs first.



Open the access door on the left side of the cab.



2. Check the oil level and fill oil reservoir (2). Remove the oil filler cap in order to add the oil to the oil reservoir.

i02093902

### **Equalizer Bar End Pins - Measure**

**SMCS Code:** 7206-082

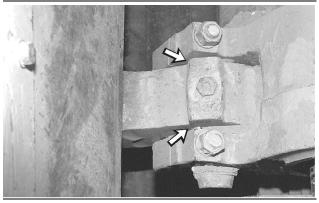


Illustration 220

g00517058

To check the equalizer bar end pin for movement and unusual wear, perform the following steps.

**Note:** All weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

 Clean the areas that are around the end pin with a high pressure wash. Inspect the condition of the seal.

- Check the area for oil leakage and a neutral seal position.
- Install a dial indicator and measure the vertical play at both end pin joints.
- **4.** Check the oil in both end pin joints.

Note: Schedule the end pin joint for repair if movement exceeds 1.50 mm (.059 inch).

Consult your Caterpillar dealer for an inspection and for repair instructions.

i02210190

### Ether Starting Aid Cylinder - Replace

**SMCS Code:** 1456-510-CD

### **WARNING**

Breathing ether vapors or repeated contact of ether with skin can cause personal injury. Personal injury may occur from failure to adhere to the following procedures.

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

Discard cylinders in a safe place. Do not puncture or burn cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.

To avoid possible injury, be sure the brakes are applied and all controls are in Hold or Neutral when starting the engine.

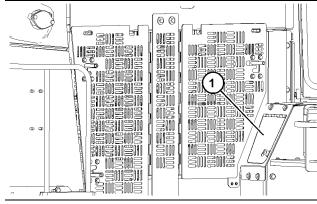


Illustration 221

g01053343

1. Open the access door on the left side of the machine (1).

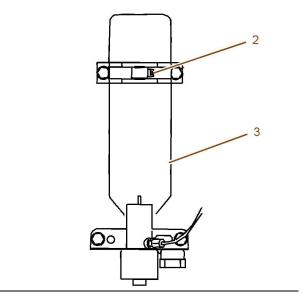


Illustration 222

g01053304

- 2. Loosen the cylinder retaining clamp (2). Unscrew the empty ether starting aid cylinder (3) and remove the cylinder.
- **3.** Remove the used gasket. Install the new gasket that is provided with each new cylinder.
- Install the new cylinder. Tighten the cylinder by hand. Tighten the cylinder retaining clamp securely.
- 5. Close the engine access door.

### Final Drive Oil - Change

SMCS Code: 4050-535-FLV

### **WARNING**

Hot oil and components can cause personal injury.

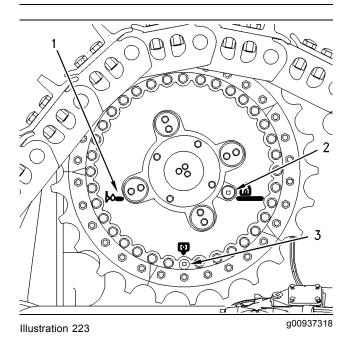
Do not allow hot oil or components to contact skin.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids in Caterpillar machines.

Dispose of all fluids according to local regulations and mandates.



- **1.** Position one final drive so that oil level mark (1) is horizontal. Drain plug (3) should face downward.
- 2. Remove drain plug (3). Allow the oil to drain into a suitable container.
- **3.** Remove oil filler plug (2) in order to vent the final drive as the oil drains out of the final drive.

- **4.** Inspect the drain plug seal. Replace the drain plug seal if the drain plug seal is damaged.
- **5.** Clean drain plug (3) and install the drain plug.
- **6.** Remove oil filler plug (2).
- Fill the final drive with oil to the bottom of the filler plug opening. See Operation and Maintenance Manual, "Refill Capacities".
- **8.** Inspect the condition of the plug seal. Replace the plug seal if the plug seal is damaged.
- Repeat Step 1 to Step 8 in order to change the oil in the other final drive.

i01834822

### Final Drive Oil Level - Check

**SMCS Code:** 4050-535-FLV

### **WARNING**

Hot oil and components can cause personal injury.

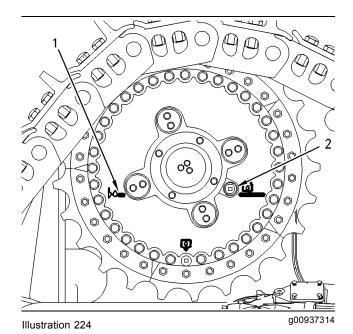
Do not allow hot oil or components to contact skin.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids in Caterpillar machines.

Dispose of all fluids according to local regulations and mandates.



- **1.** Position one final drive so that oil level mark (1) is horizontal with the oil filler plug (2).
- 2. Remove oil filler plug (2).
- The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.
- 4. Wipe the magnet in order to clean the plug.
- 5. Install oil filler plug (2).
- **6.** Repeat Step 1 to Step 5 in order to check the oil level in the other final drive.

### Final Drive Oil Sample - Obtain

SMCS Code: 3258-008; 4050-008; 7542-008

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

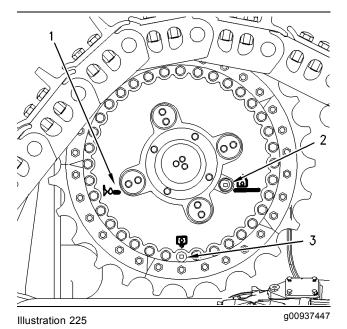
#### **NOTICE**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Obtain the sample of the differential and final drive oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S·O·S oil analysis, you must establish a consistent trend of data.



- **1.** Position one final drive so that oil level mark (1) is horizontal. Drain plug (3) should face downward.
- 2. Remove oil filler plug (2) and obtain the oil sample with a proper suction device.
- 3. Install oil filler plug (2).
- **4.** Repeat Step 1 through Step 3 in order to sample the oil in the other final drive.

# Final Drive Seal Guard - Inspect/Clean (If Equipped)

SMCS Code: 4052-040; 4052-070

**Note:** The final drive seal guards may need to be inspected more frequently than the standard 500 service hour interval when the machine is operated in very severe applications. Adjust the interval, if necessary.

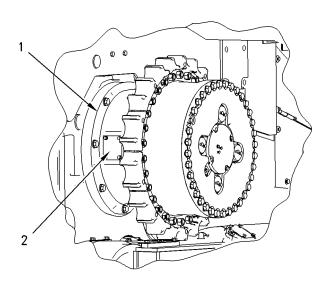


Illustration 226

g00941487

- (1) Guard
- (2) Inspection cover
- **1.** Remove the inspection cover (2) on the guard (1).
- Inspect the condition of the final drive underneath the guard. Inspect the final drive for debris or abrasive substances that are wrapped around the final drive such as cable or wire.
- If the area inside the guard is packed with debris or abrasive substances, remove guard (1) and clean the debris or abrasive substances from the guard and the final drive.
- 4. Install the guard (1) onto the final drive.
- 5. Install the inspection cover (2) on the guard (1).

**Reference:** Refer to Operation and Maintenance Manual, "Final Drive Seal Guard Packing - Replace (If Equipped)" for more information on the procedure to replace the packing.

i02782443

# Final Drive Seal Guard Packing - Replace (If Equipped)

**SMCS Code:** 4052-510

The design of the seal guard has a packing that prevents debris from entering the area of the Duo-Cone Seal Gp. The close fit and tolerances limit the size of the debris that can enter the labyrinth seal to 2 mm (0.079 inch). The labyrinth seal changes the direction of the debris four times. Contact may be made at the packing after the fourth time. The packing material is impregnated with silicone oil. Therefore, it is not necessary to fill the cavity for the packing with grease. The packing is held in place by retainers that can be removed. This allows the replacement of the packing without removing the final drive. The packing has a split that allows the packing to be placed over the spindle.

### Replacement of the Packing

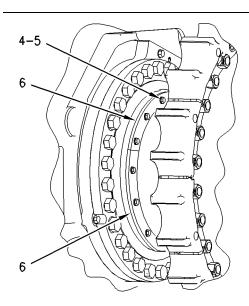


Illustration 227

g00939700

- (4) Bolt
- (5) Washer
- (6) Retainer
- **1.** Remove bolts (4) and washers (5). Remove retainers (6).

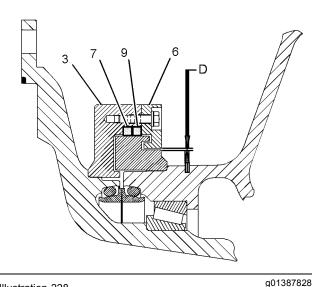


Illustration 228

Cross section view of seal guard

- (3) Seal guard
- (6) Retainer
- (7) Inner packing
- (9) Outer packing
- (D) 2 mm (0.079 inch)
- 2. Inspect the packing and the seal guard for evidence of leaking through the packing. Remove packing (7) and (9) from seal guard (3). Oil leakage through the packing would indicate leakage of the Duo-Cone Seal Gp in the final drive. Inspect the Final Drive for oil leakage through the Duo-Cone Seal Gp. If oil is leaking through the seal, replace the Duo-Cone Seal Gp. Refer to the Service Manual.

Table 22

Required Parts		
Part Number	Qty	Description
189-6244	2	Seal (packing)
129-1928	1	Grease

Note: Each final drive seal guard requires two 189-6244 Seals (packing). The sections of packing are installed on top of each other in the groove of the seal guard.

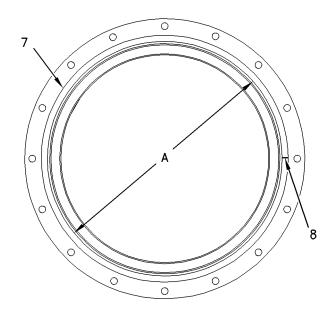


Illustration 229

g00941695

- (7) Inner packing
- (8) Joint in the inner packing
- (A) Diameter (A)
- 3. Install inner packing (7). Place a thin film of 129-1928 Grease on diameter (A). Stretch the packing during installation. Smooth the packing and keep the packing uniform. Minimize the joint (8) at the ends of the inner packing (7).

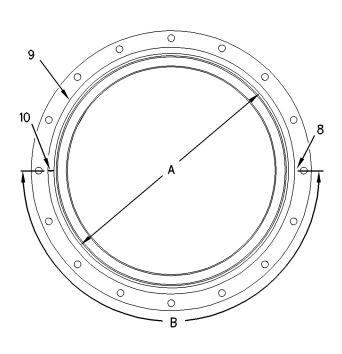


Illustration 230

g00940433

- (9) Outer packing
- (10) Joint in the outer packing
- (A) Diameter (A)
- (B) 180 degrees
- 4. Install the outer packing (9). Offset the joint in the inner packing (8) and the outer packing (10) at 180 degrees. Stretch the packing during installation. Smooth the packing and keep the packing uniform. Minimize the joint (10) at the ends of the outer packing (9).

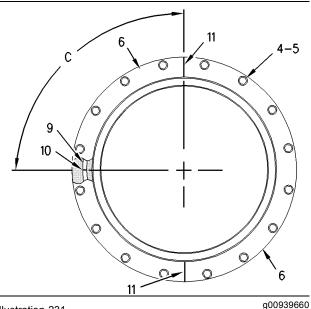


Illustration 231

- (4) Bolt
- (5) Washer
- (6) Retainer
- (9) Outer packing
- (10) Joint in outer packing
- (11) Joint in retainers
- (C) 90 Degrees from joint in outer packing to joint in retainers

**Note:** The joint (10) in the outer packing (9) must be offset 90 degrees (C) to the joints (11) in the retainers (6).

- **5.** Assemble retainers (6) to seal guard (3) with washers (4) and bolts (5). The clearance at area (D) should be 2 mm (0.079 inch).
- **6.** Repeat steps 3 through 5 in order to replace the packing on the other final drive, if necessary.
- 7. Replace the final drive seal quards.

**Reference:** Refer to Operation and Maintenance Manual, "Final Drive Seal Guard - Inspect/Clean (If Equipped)" for the correct procedure for installing the final drive seal guards.

# Fuel Lines - Replace (Low Pressure)

SMCS Code: 1274

#### NOTICE

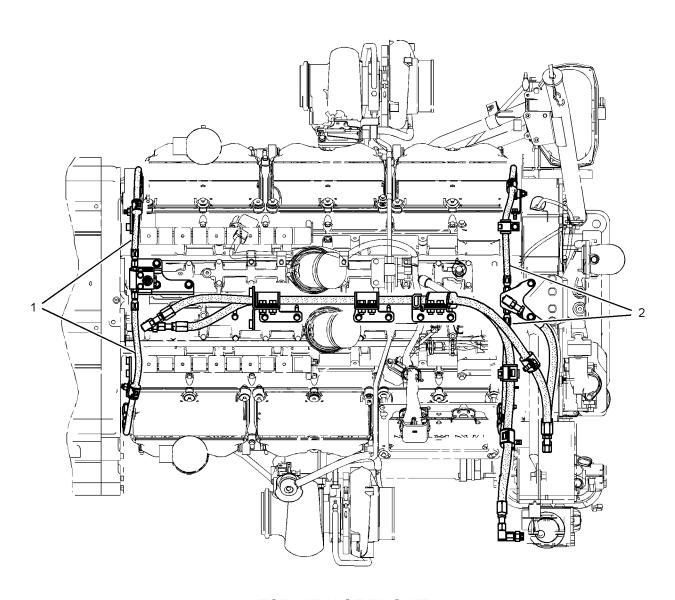
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

## **Replace Nonmetallic Fuel Lines**

Make sure to replace the nonmetallic fuel lines at the engine overhaul.



**TOP VIEW OF ENGINE** 

Illustration 232
Top view of engine

#### NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Remove and install the rear two low-pressure fuel lines (1) with new hoses.

2. Remove and install the front two low-pressure fuel lines (2) with new hoses.

**Reference:** Refer to the Engine Disassembly and Assembly for information on removing and installing the fuel lines.

**Note:** Make sure that the hoses do not contact nearby components. Contact with other surfaces will produce chafing that could lead to a leak. A properly installed hose will contact only the hose clips.

g02141035

## **Fuel System - Prime**

SMCS Code: 1258

If the engine does not start, air may be trapped in the fuel lines to the engine. Use the following procedure in order to purge air from the fuel lines.

## **Electric Fuel Priming Pump**

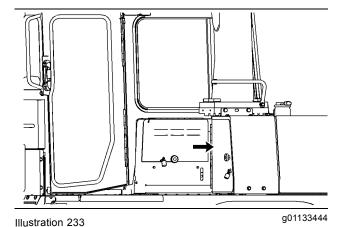
#### **NOTICE**

Use a suitable container to catch any fuel that might spill. Clean up any spilled fuel immediately.

#### NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over disconnected fuel system component.

1. Turn the ignition switch to the "OFF" position.



2. Open the access door on the left side of the cab.

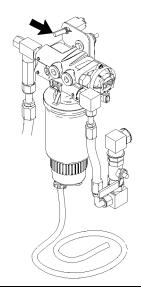


Illustration 234

g01047632

- **3.** Move the switch for the electric fuel priming pump to the ON position. Allow the fuel priming pump to run for several seconds.
- **4.** Return the switch for the fuel priming pump to the OFF position.

#### NOTICE

Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

**5.** Start the engine. If you cannot start the engine, the engine needs more priming. If the engine continues to misfire or to smoke, more priming is necessary.

**Note:** The electric fuel priming pump will only operate if the engine start switch key is in the OFF position. Shut off the engine before any additional priming.

- **6.** Run the engine at the LOW IDLE position until the engine runs smoothly.
- 7. Close the access door.

**Note:** Do not activate the priming pump while you crank the engine.

# Fuel System Primary Filter - Clean/Replace

SMCS Code: 1260-070-PY; 1260-510-PY

### **A** WARNING

Personal injury can result from air pressure.

Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.

Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

## **WARNING**

Personal injury can result when using cleaner solvents.

To help prevent personal injury, follow the instructions and warnings on the cleaner solvent container before using.

### **WARNING**

Personal injury or death can result from a fire.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

#### NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

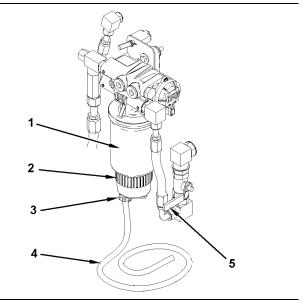


Illustration 235

g01047193

Close the fuel shutoff valve (5).

1. Place drain hose (4) on the outside of the machine.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

- Open drain valve (3) under water separator bowl
   (2). The water separator bowl is under the primary fuel filter.
- **3.** Remove primary filter element (1) and water separator bowl (2). Make sure that all of the old filter seals are removed from the filter base.
- **4.** Remove the water separator bowl from the primary filter element.
- **5.** Wash the water separator bowl in a clean nonflammable solvent. Use pressure air to dry the water separator bowl.

- 6. Install clean water separator bowl (2) onto a new primary filter element (1). Only hand tighten the water separator bowl. When the seal contacts the base, tighten the water separator bowl for an additional 1/4 turn.
- 7. Clean the filter base.
- 8. Coat the seal of the new primary filter element with clean diesel fuel.
- Install primary filter element (1) onto the filter. Only hand tighten the primary filter element. When the seal contacts the base, tighten the primary filter element for an additional 1/3 to 1/2 turn.
- 10. Place drain hose (4) in position.
- **11.** Close drain valve (3).
- 12. Open the fuel shutoff valve.

# Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

## **WARNING**

Personal injury can result from air pressure.

Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.

Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

## **WARNING**

Personal injury can result when using cleaner solvents.

To help prevent personal injury, follow the instructions and warnings on the cleaner solvent container before using.

### **A** WARNING

Personal injury or death can result from a fire.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

#### **NOTICE**

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

**Note:** Before you replace the secondary fuel filter element, replace the primary fuel filter element.

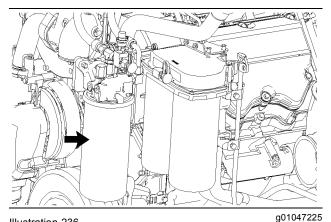


Illustration 236 RJG1-528

The secondary fuel filter is located behind the access door on the left side of the machine.

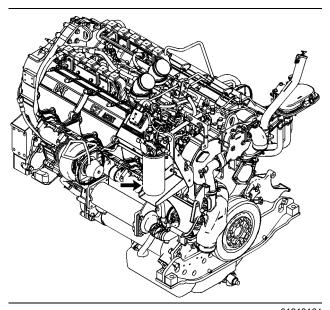


Illustration 237 RJG529-Up g01218164

The secondary fuel filter is located behind the access door on the right side of the machine.

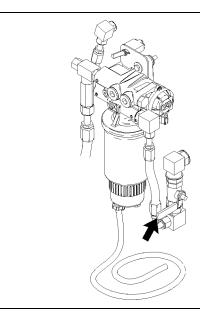


Illustration 238

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Primary fuel filter and fuel shutoff valve

- Close the fuel shutoff valve. The fuel shutoff valve is located on the front left side of the fuel tank.
- 2. Remove the filter element. Discard the filter element properly.
- Clean the filter housing base. Make sure that all of the old seal is removed.

- Coat the seal of the new filter element with clean diesel fuel.
- Install the new filter element by hand. When the seal contacts the base, tighten the secondary filter element for an additional 1/3 to 1/2 turn.

Rotation index marks are positioned on the filter element at 90 degree intervals. Use these rotation index marks as a guide when you tighten the filter.

- 6. Open the fuel shutoff valve.
- **7.** Prime the fuel system.

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# Fuel Tank Cap Filter and Strainer - Replace/Clean

**SMCS Code:** 1273-070-STR; 1273-070-Z2

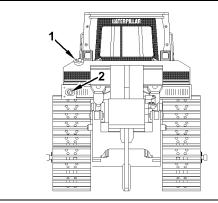


Illustration 239

g01022482

The fuel tank is located on the rear of the machine. The filler cap (1) is on the left side of the machine next to the ROPS.

Only vented fuel caps have filters. Machines without the fast fill fuel adapter require a vented fuel cap.

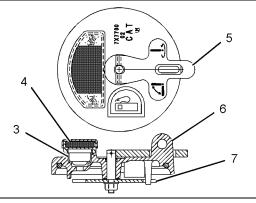


Illustration 240 g01110732

- SEBU7764-10
- Lift lever (5) in order to remove the fuel tank filler cap. Turn the lever counterclockwise until the lever stops. Lift the cap straight up in order to remove the cap.
- 2. Remove the fuel strainer from the filler neck.
- 3. In order to replace the filter assembly, remove two screws that secure filter assembly (4) to the fuel cap. Remove filter assembly (4), valve (3), and the gaskets.
- Wash the cap and the strainer in a clean, nonflammable solvent.
- Inspect the tank cap seal. If the seal is damaged, replace the seal.
- **6.** Replace the filter assembly, the valve, the gaskets, and the screws. Use a 9X-2205 Cap Filter Kit.
- 7. Install the strainer.
- 8. Install the fuel cap. Rotate the fuel cap clockwise until three tabs (7) drop into the slots in the adapter. Rotate lever (5) clockwise until the lever stops. Lower lever (5) over locking tab (6).

## Fast Fill Fuel Adapter (If Equipped)

See illustration 239.

Machines that are equipped with a fast fill fuel adapter (2) have identical fuel caps as systems without a fast fill fuel adapter. Use the same procedure for changing the filter in the two systems.

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# Fuel Tank Water and Sediment - Drain

**SMCS Code:** 1273-543-M&S

### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

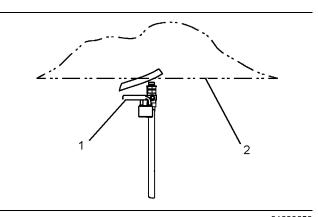


Illustration 241

g01390659

Rear view

The drain valve is under the fuel tank at the rear of the machine.

- Open drain valve (1) under the left side of fuel tank (2). (Unlock the drain valve, as needed.) Allow the water and the sediment to drain into a suitable container.
- Close the drain valve. Lock the drain valve, if necessary.

i02606340

# Fuses and Circuit Breakers - Replace/Reset

SMCS Code: 1417-510; 1420

Fuses – Fuses protect the electrical system from damage that is caused by overloaded electrical circuits. Replace

a fuse if the element separates. If the fuse of a particular electrical system requires frequent replacement, check the electrical circuit. Repair the electrical circuit, if necessary.

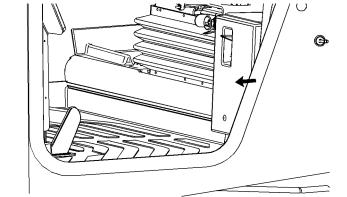


Illustration 242

g01053625

168
Maintenance Section
High Intensity Discharge Lamp (HID) - Replace

The access cover for the fuses and the circuit breakers is located inside the cab on the left side of the seat.

Open the cover for access to the circuit breakers and the fuses.

#### NOTICE

Always replace fuses with the same type and capacity fuse that was removed. Otherwise, electrical damage could result.

#### NOTICE

If it is necessary to replace fuses frequently, an electrical problem may exist.

Contact your Caterpillar dealer.

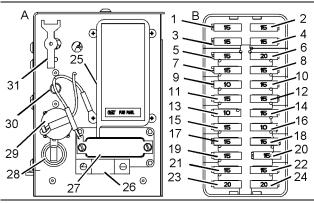


Illustration 243

g01106464

- (A) Open fuse box
- (B) Open fuse panel

ROPS floodlights(1) - 15 Amp

Ripper floodlights (2) (Cylinder) - 15 Amp

ECM engine monitoring (3) (Power train ECM) – 15 Amp

Rear ROPS floodlights (4) - 15 Amp

Auxiliary (5) - 10 Amp

**Spare (6) -** 20 Amp

GPS/Radio Transmission Antenna (7) – 15 Amp

Seat, Ripper, or Implements (8) - 15 Amp

Standard Converter (9) - 10 Amp

**Spare (10) -** 15 Amp

"Accugrade" (11) - 15 Amp

Wipers (12) - 15 Amp

Ignition Key (13) - 10 Amp

Fender Floodlights (14) - 15 Amp

Horn (15) - 15 Amp

**CAES Display (16)** – 10 Amp

Secondary Brake (17) - 15 Amp

Unswitched Auxiliary (18) - 15 Amp

Product Link (19) - 15 Amp

Advisor Panel (20) - 15 Amp

Implement ECM (21) - 15 Amp

Implement ECM (22) - 15 Amp

**Engine ECM (23)** - 20 Amp

24 VA - 12 VA Converter (24) (Attachment) - 20 Amp

Cover (25) - Fuse panel

Fuse (26) - 175 Amp

Fuse cover(27) - Plastic

Power outlet(28) - 12 Volt

Starting/Charging Analyzer (29) (Plug) - 70-pin Connector

HVAC blower (30) (Reset button) - 15 Amp

Fuse Puller (31) - Auto Stop

Remote Air Conditioner Condenser (32) - 15 Amp

i02245859

# High Intensity Discharge Lamp (HID) - Replace (If Equipped)

**SMCS Code:** 1434-510

## **A** WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

### **MARNING**

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

#### NOTICE

Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

- Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least five minutes, in order to ensure that the bulb is cool.
- Disassemble the housing for the HID lamp in order to have access to the bulb.

**Note:** On some HID lamps, the bulb is an integral part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

- 3. Remove the bulb from the HID lamp.
- 4. Install the replacement bulb in the HID lamp.

If the bulb is an integral part of the lens assembly, install the replacement lens assembly in the HID lamp.

**Note:** In order to avoid failure to the bulb that is premature, avoid touching the bulb's surface with your bare hands. Clean any fingerprints from the bulb with alcohol prior to operation.

- Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly with respect to the HID lamp's mounting position on the machine.
- **6.** Reattach the electrical power to the HID lamp.
- 7. Check the HID lamp for proper operation.

**Note:** Consult your Caterpillar dealer for additional information on HID lamps.

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## Horn - Test

SMCS Code: 7402-081

Test the horn on a daily basis. Press downward on the horn button in order to sound the horn. If the horn does not sound, make the necessary repairs before you operate the machine.

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# Hoses and Clamps - Inspect/Replace

**SMCS Code:** 7554-040; 7554-510

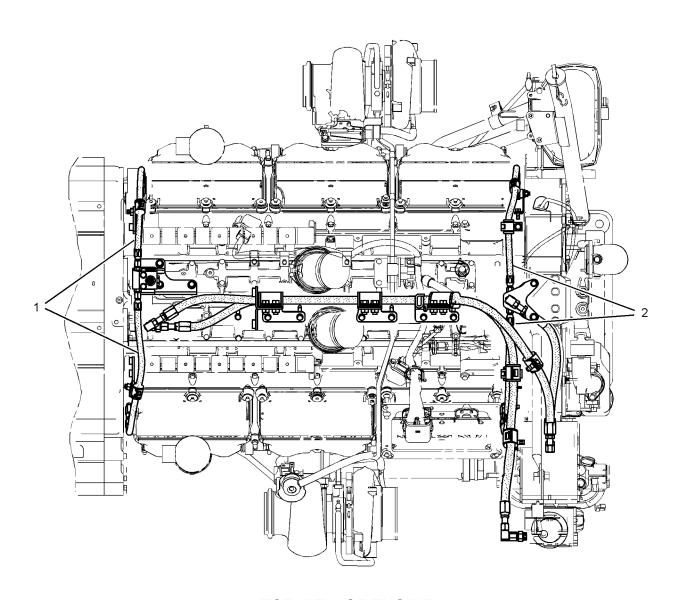
## Inspect the Hoses and the Clamps

The nonmetallic hoses and the clamps must be inspected periodically in order to ensure safe operation and continuous operation of the engine fuel system. Take proper safety precautions before inspecting or replacing hoses and clamps.

**Note:** Always use a board or cardboard when the engine components are checked for leaks. Leaking fluid that is under pressure can cause serious injury or possible death. This proceeding includes leaks that are the size of a pin hole. Refer to Operation and Maintenance Manual, "General Hazard Information" for more information.

#### Nonmetallic Fuel Lines

**Note:** Make sure that the hoses do not contact nearby components. Contact with other surfaces will produce chafing that could lead to a leak. A properly installed hose will contact only the hose clips.



TOP VIEW OF ENGINE

Illustration 244

(1) Rear low-pressure fuel lines

(2) Front low-pressure fuel lines

Inspect hoses (1, 2) of the engine fuel system for the following conditions.

Replace any hose which exhibits any of the following conditions.

- · Hoses which are cracked
- · Hoses which are soft
- · Outer covering that is chafed or cut

- · Outer covering that is ballooning locally
- Flexible part of the hose that is kinked or crushed

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 Hoses which exhibit signs of leakage which are not the result of loose couplings or clamps

Inspect all hose couplings for leaks. Replace any hose that exhibits signs of coupling leakage.

Inspect all clamps for the following conditions. Replace any parts that exhibit signs of any of the following conditions.

- · Missing or damaged grommets
- · Missing fasteners
- · Missing clamps

Failure to replace a non-metallic fuel line (hose) which exhibits any of the above conditions may result in a leak.

## Replace the Hoses and the Clamps

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" or refer to Special Publication, PECJ0003, "Caterpillar Shop Supplies and Tools Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

**Reference:** Refer to the Engine Disassembly and Assembly for information on removing and installing the low-pressure fuel lines.

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# Hydraulic System Filter Bypass Screen - Clean

**SMCS Code:** 5068-070

The screen should be cleaned especially when one of the following situations have occurred:

- Failure of the Implement Pump
- · Failure of the Fan Pump
- · Failure of the Fan Motor
- Cleaning of the Hydraulic Tank
- PCR (Engine Overhaul)
- 1. Park the machine on a level surface. Lower the work tool to the ground. Engage the parking brake.

- 2. Turn the engine start switch key to ON.
- **3.** Move the hydraulic control levers through all of the positions in order to release pressure.
- **4.** Turn the engine start switch key to OFF.

### **WARNING**

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Before removing the filler cap, press the valve relief button on the hydraulic tank in order to relieve the tank pressure.

Remove the filler cap only when the engine is stopped and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve any remaining pressure.

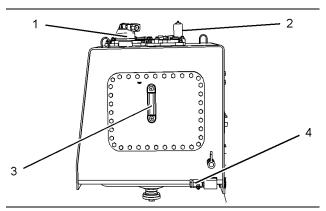


Illustration 245

g01944042

Front view of the hydraulic tank

- (1) Filler Cap
- (2) Breaker Relief Valve
- (3) Sight Glass
- (4) Drain Valve
- **5.** Press the button on the breaker relief valve (2) in order to relieve any tank pressure. Slowly remove filler cap (1).

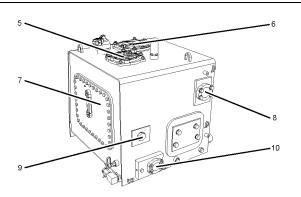


Illustration 246 g01944045

Bottom view of the Hydraulic Tank

- (5) Suction for Fan Drive Pump
- (6) Suction for Implement Pump
- (7) Hydraulic tank access cover
- (8) Implement return port
- (9) Case drain return
- (10) Fan return
- 6. Drain the hydraulic oil tank at drain (4).

**Reference:** For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil - Change".

- 7. Disconnect the drain lines.
- 8. Unbolt hydraulic tank access cover (7).

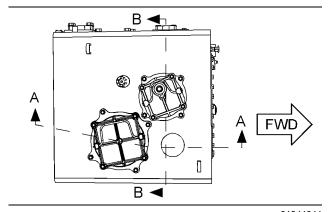


Illustration 247

g01944044

Top view of the Hydraulic Tank

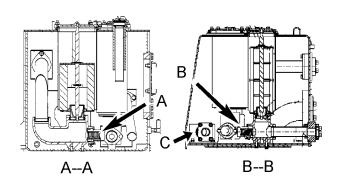


Illustration 248

g01944047

Return screens

- (A) Implement return
- (B) Case drain return
- (C) Fan return
- **9.** Remove return screens that are within reach. It may be necessary to remove the filter from the top to reach one return screen. Clean the screens with a clean, nonflammable solvent.
- **10.** Inspect the O-ring seal, if the casting is removed. If the seal is damaged, replace the seal.
- **11.** Replace the return screens.
- 12. Replace hydraulic tank access cover (7).
- 13. Assemble the drain lines.
- 14. Fill the hydraulic tank.

**Reference:** For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil - Change".

15. Replace filler cap (1).

## **Hydraulic System Oil - Change**

SMCS Code: 5050-044

Note: The normal hydraulic oil change interval is at every 2000 Service Hours or 1 Year. By performing S·O·S oil analysis, the hydraulic oil change interval may be extended to 4000 Service Hours or 2 Years. S·O·S oil analysis must be performed at every 500 Service Hours or 3 Months in order to extend the hydraulic oil change interval. The results from the S·O·S oil analysis will determine if the hydraulic oil change interval may be extended. If S·O·S oil analysis is not available, the hydraulic oil change interval must remain at every 2000 Service Hours or 1 Year . Refer to the Operation and Maintenance Manual, "Hydraulic System Oil Sample - Obtain".

### **A** WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the oil. Park the machine on level ground. Lower the blade to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

The hydraulic tank is located on the right side of the cab.

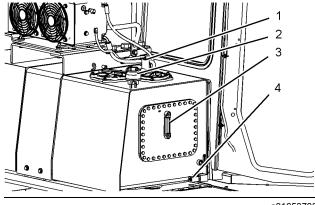


Illustration 249

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- 1. Remove the pressure in the hydraulic tank. Press the stem in the center of the valve (1).
- 2. Remove the hydraulic tank filler cap (2) slowly in order to prevent the rapid escape of oil or air.
- **3.** Clean the filler strainer and the filler cap in a clean nonflammable solvent.
- 4. Remove the oil drain plug (4).
- 5. Attach a hose to a swivel. Install the swivel and the hose into the drain plug opening. A pipe nipple and a hose can also be used. Do not tighten the pipe.
- **6.** Use a 8 mm wrench or a adjustable wrench to open the drain valve. Allow the oil to drain into a suitable container.

**Note:** If there is a failure the hydraulic tank and the hydraulic screen must be cleaned. Refer to Operation and Maintenance Manual, "Hydraulic System Return Screen-Clean" for the procedure.

- Remove the swivel. The valve for the hydraulic tank will close.
- 8. Clean the drain plug and install the drain plug. Tighten the drain plug to a torque of 68 ± 7 N·m (50 ± 5 lb ft). Install the oil drain plug cover.
- Change the hydraulic system filter. See Operation and Maintenance Manual, "Hydraulic System Oil Filter - Replace".
- 10. Install the filler strainer.
- **11.** Fill the hydraulic oil tank. See Operation and Maintenance Manual, "Refill Capacities" in order to determine the amount of hydraulic oil that is needed to fill the hydraulic oil tank.
- **12.** Inspect the filler cap gasket. Replace the gasket if damage or wear is evident.

- 13. Install the filler cap.
- 14. Start the engine. Run the engine for a few minutes.
- **15.** Maintain the oil level to the "FULL" mark in the sight gauge (3). Add oil, if necessary.
- 16. Stop the engine.

# Hydraulic System Oil Filter (Pilot) - Replace

**SMCS Code:** 5068-510; 5068-510-PS; 5092-510

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

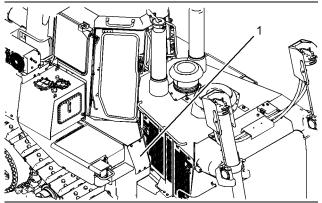


Illustration 250

g01059883

The pilot oil filter is located inside the access panel (1) on the right side of the machine.

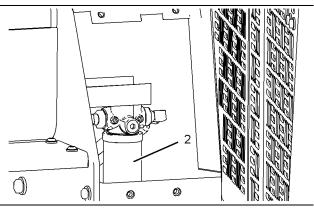


Illustration 251

g0106002

- 1. Remove the filter element (2). Dispose of the used filter element properly.
- 2. Install a new filter element.
- **3.** Start the machine. Allow the hydraulic oil to warm.
- **4.** Check the machine for leaks. Repair any leaks, if necessary.

i02277262

# Hydraulic System Oil Filters - Replace

**SMCS Code:** 5068-510

## **WARNING**

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids.

Dispose of all fluids according to local regulations and mandates.

**Note:** The hydraulic tank is equipped with two filter elements. The hydraulic tank is located on the right side of the cab.

**1.** Lower the bulldozer and the ripper to the ground.

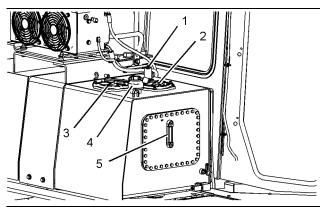


Illustration 252

g01053825

- 2. Check the pressure in the hydraulic tank. Press the stem in the center of the valve (1) in order to relieve the system pressure.
- 3. Remove the nuts from the covers (2) and (3). Rotate the covers counterclockwise in order to remove the covers. Remove the cover seals. Replace the cover seals if the seals are damaged.

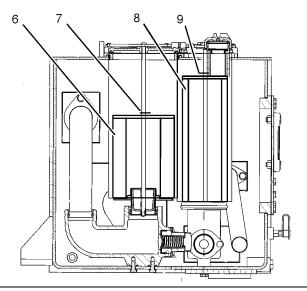


Illustration 253

g01053837

- 4. Remove the rods (7) and (9) that retain the filter elements. Unscrew the nuts that are located at the bottom of the rods. Remove the filter elements (6) and (8) by sliding the filters off rods (7) and (9). Properly discard the filter elements. Install new filter elements. Screw the nuts onto the rods and tighten the nuts to a torque of 10 ± 1.5 N·m (7.4 ± 1.1 lb ft).
- **5.** Place filters back into the hydraulic tank.
- 6. Wash the covers in a clean nonflammable solvent.
- 7. Install the seals and the covers.
- **8.** Maintain the hydraulic oil to the "FULL" mark in the sight gauge (5).

# Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV; 7479

### **A WARNING**

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

Lower the bulldozer and the ripper to the ground.

The hydraulic tank is on the right side of the cab.

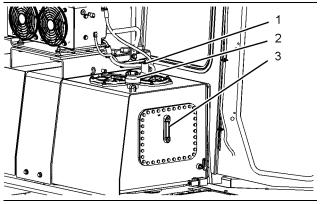


Illustration 254

g01053736

 Maintain the oil level to the "FULL" mark in the sight gauge (3). Put the tilt cylinders in the center position before you check the oil level. Check the oil level when the oil is cold. Verify that the oil level is below the "FULL" mark before you remove the filler cap.

If the hydraulic system requires additional hydraulic oil, perform the following procedure.

- 1. Check for pressure in the hydraulic tank. Press the stem in the center of the valve (1).
- 2. Use caution to remove filler cap (2). Slowly remove the filler cap and add oil through the filler tube.
- 3. Clean the filler cap and install the filler cap.

i02054835

# Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008; 7542-008

#### **WARNING**

Hot oil and components can cause personal iniury.

Do not allow hot oil or components to contact skin.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Obtain the hydraulic oil sample as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S·O·S oil analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

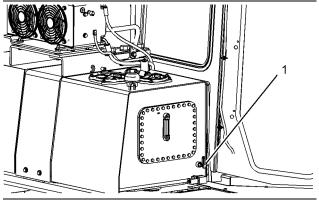


Illustration 255

g01053745

**1.** Remove the protective cap from the sampling valve (1).

- Use 169-8373 Fluid Sampling Bottle in order to obtain the sample.
- 3. After you take a sample, remove the cap with the tube and the probe from the bottle. Discard the cap with the tube and the probe. Install the sealing cap that is provided with 169-8373 Fluid Sampling Bottle.
- 4. Replace the protective cap.

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for the correct fluid for your machine.

i02184397

q01106466

## **Indicators and Gauges - Test**

SMCS Code: 7450-081

### **A WARNING**

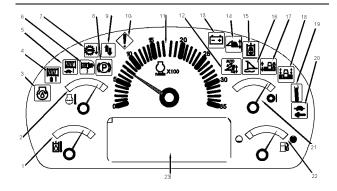
If the action alarm does not sound during this test or machine monitoring displays are not functioning, do not operate the machine until the cause has been corrected. Machine operation with faulty action alarms or displays could result in injury or death as any Warning Category 3 notifications will not be relayed to the operator.

Check the operation of the Monitoring System. Observe the self test when you start the engine.

The system performs an automatic self test when you turn the engine start switch to the ON position.

The self test verifies that the monitoring panel and the display modules are operating properly.

The internal circuits, the indicators, and the gauges are automatically checked.



The operator must observe the indicators and the gauges in order to determine whether gauge modules, the action light, the alert indicators, and the display screen are operating properly. The self test lasts for approximately three seconds.

During the self test, all alert indicators flash.

The digital display shows the following readouts:

- All indicators of units (Deg C, kPa, rpm, and liters)
- "X100" readout
- Symbol for the hour meter
- "8.8.8.X.8.8" readout

The pointers in the gauges point upward. Then, the pointers point to the left. Then, the pointers point to the right. Then, the pointers point to the final positions.

- The speed readout shows "188", "MPH", and "km/h".
- The action light stays illuminated.
- · The action alarm sounds once.

The monitoring panel is then in the normal operating mode.

If the above tests are not correctly completed, the system will not function in the normal operating mode. Consult your Caterpillar dealer for an electrical system check. Any repairs must be made before you start the engine.

Turn on all of the machine lights. Check for proper operation. Sound the forward horn.

Stop the engine.

Make any necessary repairs before you operate the machine.

i03600040

## Ladder - Adjust

SMCS Code: 0634-025; 7254-025

## **Adjust the Access Ladder**

## **WARNING**

Do not ride on ladder or stand on platform while machine is moving.

Illustration 256

#### NOTICE

To avoid damage to the ladder during machine operation, keep the ladder in the LATCHED position.

- 1. Position adjustment for the hinge.
  - a. Adjust the hinge so that the ladder is parallel to the top surface of the fender with the ladder in the UP position.
- 2. Adjustment for the location of the latch
  - **a.** The latch should be adjusted so that the pins for the latch are equally engaged in the top and the bottom of the ladder.
- 3. Adjustment for the contact plates on the latch
  - a. The contact plates on the latch should be adjusted in order to prevent any vertical movement or any side to side movement of the ladder when the latch pins are engaged in the ladder.
- **4.** Adjustment for the location of the proximity switch
  - a. With the ladder in the Up position, adjust the proximity switch so that the switch and the magnet are aligned.
  - b. There must be a gap between the magnet and the switch in order to prevent contact when the ladder moves. The gap between the magnet and the switch must be close enough to function correctly.

i03996530

# Ladder Hinge Oil - Change

SMCS Code: 0634-510-OC; 7254-510-OC

## Change the Oil

- 1. Park the machine.
- 2. Clean the areas on the hinge block that are near the oil level/fill plug and near the drain plug.
- **3.** Remove the drain plug from the hinge block. Drain the oil completely into a suitable container.

**Note:** Inspect the oil for particles. Large particles indicate that a failure has occurred. Consult your Cat dealer if this issue occurs.

**4.** Install the drain plug. Fill the hinge block with "FDA060" oil to the bottom of the oil level/fill plug.

- **5.** Install the oil level/fill plug. Inspect the hinge block for leaks. Repair any visible leaks.
- **6.** Start the engine. See "Starting Engine".

i02055282

# Lift Cylinder Yoke Bearings - Lubricate

SMCS Code: 5102-086-BD

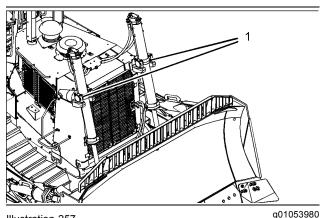


Illustration 257

(1) Lift cylinder yoke

**J**. .....

The fittings are on the left front side of the machine and on the right front side of the machine. Lubricate the bearings by applying MPGM grease to the fittings.

i02106227

# Oil Filter - Inspect

**SMCS Code:** 1318-507; 3067-507; 5068-507

## Inspect a Used Filter for Debris

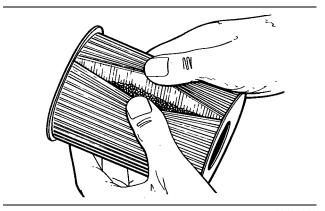


Illustration 258

g00100013

The element is shown with debris.

Use a filter cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminum parts of the engine such as main bearings, rod bearings, or turbocharger bearings.

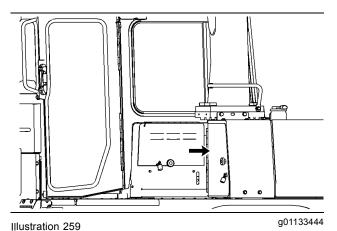
Small amounts of debris may be found in the filter element. This could be caused by friction and by normal wear. Consult your Caterpillar dealer in order to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar can result in severe engine damage to engine bearings, to the crankshaft, and to other parts. This can result in larger particles in unfiltered oil. The particles could enter the lubricating system and the particles could cause damage.

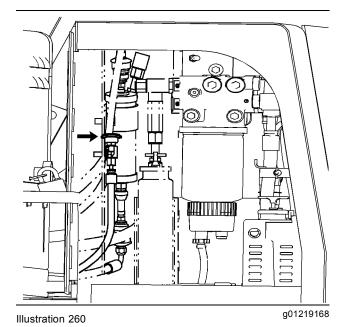
i03996833

## **Power Train Breather - Clean**

SMCS Code: 3030-070-BRE



1. Open the access door on the left side of the cab.



- 2. Remove the breather. Clean the breather in a clean, nonflammable solvent. Allow the breather to air dry.
- If the transmission breather is damaged or if the breather is not reusable, discard the used breather element. Install a new breather element.
- 4. Install the transmission breather.

### **Alternate Location**

Some later machines will have an alternate location for the power train breather. This location is inside the enclosure above the left fender.

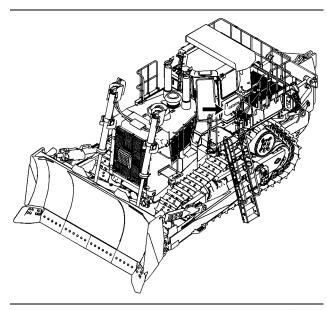


Illustration 261 g02174560

Open the access door to the left side enclosure, as shown. Unscrew and remove the transmission breather.

1. Perform steps 2 to 4

i03652871

# Power Train Oil Filters - Replace

SMCS Code: 3067-510

### **A WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

#### **NOTICE**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

The transmission and torque converter oil filters are under the fuel tank on the rear of the machine.

# Lifting the Transmission Guard (if equipped)

 If the machine is equipped with a transmission guard, support the transmission guard with the proper lifting device.

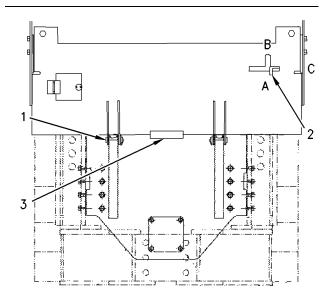


Illustration 262

g00610821

Rear view of machine

- 2. Remove the lock pin bolt, secondary bar pin and washer (1) from the bracket.
- Lift transmission guard (3) from the bottom of the guard. Lift the transmission guard until the end of handle (2) extends beyond the fender to position (C). This locks the guard in the OPEN position.

# Replace the Transmission and Torque Converter Oil Filters

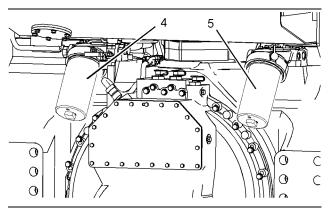


Illustration 263

g01050289

Transmission oil filter 4

Torque converter oil filter 5

Note: The Caterpillar recommended filters are a special high efficiency design. Use only the recommended filter.

#### NOTICE

The element in the transmission oil filter can become plugged with debris.

The flow of clean oil to the system will decrease or stop.

Follow maintenance recommendations to ensure element will not fill up with debris.

#### NOTICE

Dirty oil or debris left in the transmission filter housing during filter change can enter the transmission and cause serious damage.

Use a clean, dry cloth to clean the bottom of the hous-

- 1. Remove the filter element housing for the transmission oil filter (4) and the torque converter oil filter (5).
- 2. Remove the filter elements and properly discard the filter elements.
- 3. Clean the inside of the filter element housings with a clean, dry cloth.
- 4. Inspect the seals for the housings. If a seal is damaged, replace the seal.
- 5. Install the new filter elements. Install the filter element housings.
  - a. Torque the filter element housings to 61 ± 7 N·m  $(45 \pm 5 lb ft)$ .
- 6. Start the engine.
- 7. Check the transmission oil level. Refer to Operation and Maintenance Manual, "Transmission Oil Level - Check" for details.

## **Lower the Transmission Guard (if** equipped)

- 1. To lower transmission guard (3), support the guard with the proper lifting device.
- 2. Position handle (2) to area (B).
- 3. Lower the transmission guard. Install the secondary bar pin, the washer and lock pin bolt (1) to the brackets.
- 4. Return handle (2) to position (A).

# **Power Train Oil - Change**

SMCS Code: 4000-044-OC

#### **WARNING**

Hot oil and components can cause personal in-

Do not allow hot oil or components to contact skin.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the power train oil. The machine must be level. Lower the attachments with slight down pressure.

Engage the parking brake switch. Stop the engine.

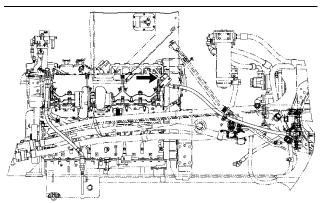


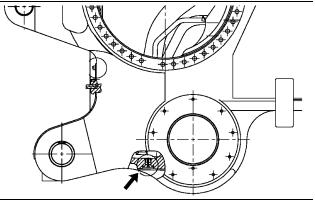
Illustration 264

g01229675

High speed oil change (transmission)

1. Open the left engine compartment. The machine may be equipped for a high speed oil change. Use a 126-7538 Nozzle Assembly. The high speed oil change removes oil from the sump in the bevel gear case. The high speed oil change does not remove oil from the torque converter or from the transmission case.

i03965831



- g01181288 Illustration 265
- 2. If the machine is not equipped with the high speed oil change system, remove the plug from the drain in the bevel gear case. Install a 4C-8563 Swivel into the valve. Clamp a hose to the swivel. A 25.4 mm (1 inch) pipe and hose can be used. Use a 25.4 mm (1 inch) pipe with 1-11 1/2 NPTF threads. Do not tighten the pipe.
- 3. Turn the swivel or pipe clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.

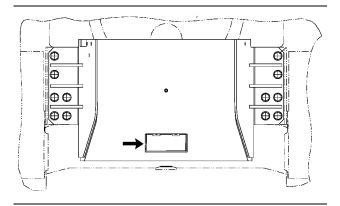


Illustration 266

q01181367

4. Remove the access cover for the transmission drain plug.

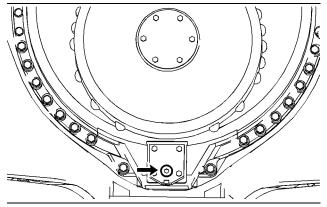


Illustration 267

g02161317

- 5. Remove the plug from the drain valve in the transmission. Install a 12.7 mm (.50 inch) pipe into the transmission valve. Use a 12.7 mm (.50 inch) pipe with 1/2-14 NPTF threads.
- **6.** Clamp a hose to the pipe in order to drain the oil into a suitable container.
- 7. Open the drain valve and drain the oil into a suitable container.
- **8.** Close the drain valve in the transmission case.
- **9.** Remove the hoses and remove the pipes from the drains.
- 10. Remove the swivel or remove the pipe from the drain in the bevel gear case. The drain valve will close.
- 11. Clean the oil drain plugs and install the oil drain plugs.
- 12. Change the filter element. See Operation and Maintenance Manual, "Power Train Oil Filter -Replace".

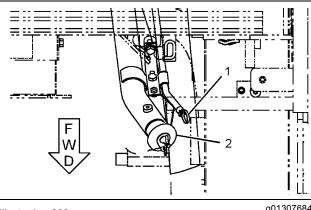


Illustration 268

q01307684

13. Open the left engine compartment for the transmission oil filler cap.

SEBU7764-10

- **14.** Remove the transmission oil filler cap (2).
- 15. Add oil. To determine the correct amount of oil, see Operation and Maintenance Manual, "Capacities (Refill)".
- **16.** Clean the transmission oil filler cap and install the transmission oil filler cap.

{OIL AT OPERATING TEMP } { → OPR ZONE 30L → }

Illustration 269

g00611366

17. Maintain the oil level in the "OPR ZONE" on the dipstick (1). Close the access door.

i03652864

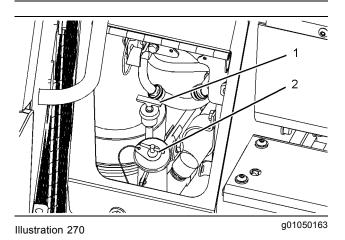
# Power Train System Oil Level - Check

SMCS Code: 3030-535-FLV

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.



Open the access door on the left side of the machine.

OIL AT OPERATING TEMP } { ── OPR ZONE 18L ── }

Illustration 271

q00594099

### **HOT TRANSMISSION OIL**

Use the "TRANSMISSION IN NEUTRAL, ENGINE AT LOW IDLE, AND OIL AT OPERATING TEMPERATURE" side of the dipstick (1). Check when the transmission is in NEUTRAL and the engine is running at LOW IDLE. The oil should be at operating temperature. Maintain the oil level between the "OPERATING ZONE" marks. This is the only accurate way to check the oil level.

Remove filler plug (2). If necessary, add oil.

Clean the filler plug and install the filler plug.

#### COLD TRANSMISSION OIL

Check the "ENGINE STOPPED COLD OIL" side of dipstick (1) while the engine is stopped. Maintain the oil between the "OPERATING ZONE" marks. This method should be used as reference only.

Remove filler plug (2). If necessary, add oil.

Clean the filler plug and install the filler plug.

**Note:** When you are operating the machine on severe slopes, the quantity of oil in the transmission can be increased up to 10 percent. When you are operating with the increased oil quantity, prolonged operation in some machines can cause high transmission oil temperatures. After the work on the severe slopes has been completed, drain the excessive oil quantity from the bevel gear case.

## **Power Train System Oil Sample** - Obtain

SMCS Code: 3080-008

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

#### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

The transmission oil filter is under the fuel tank on the rear of the machine.

1. If the machine is equipped with a transmission guard, support the transmission guard with the proper lifting device.

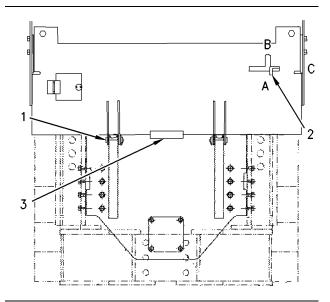


Illustration 272

a00610800

Transmission guard at the rear of the machine

- 2. Remove the lock pin bolt, secondary bar pin and washer (1) from the bracket.
- 3. Lift transmission guard (3) from the bottom of the guard. Lift the transmission guard until the end of handle (2) extends beyond the fender to position (C). This locks the guard in the OPEN position.

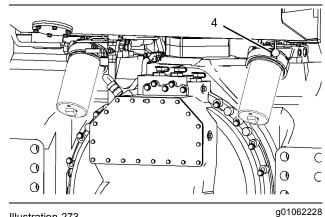


Illustration 273

4. Remove the protective cap (4) from the sampling valve.

Note: Flush the fitting with oil into an approved container before you obtain the oil sample.

5. Use the 8T-9190 Fluid Sampling Bottle in order to obtain a sample.

- 6. After you take a sample, remove the cap with the tube and the probe from the bottle. Discard the cap with the tube and the probe. Install the sealing cap that is provided with 8T-9190 Fluid Sampling Bottle.
- Replace the protective cap (4) for the sampling valve.
- **8.** To lower transmission guard (3), support the guard with the proper lifting device.
- 9. Position handle (2) to area (B).
- Lower the transmission guard. Install the lock pin bolt, secondary bar pin and washer (1) to the brackets.
- **11.** Return handle (2) to position (A).

# Power Train System Screens - Clean

**SMCS Code:** 3067-070

### **MARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

#### **NOTICE**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids in Caterpillar machines.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the power train oil. The machine must be level. Lower the work tools with slight down pressure.

When you change the transmission oil, clean the scavenge screens.

### **Transmission**

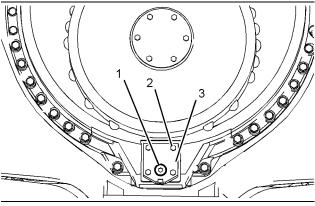


Illustration 274

g02161128

- **1.** Remove the plug from the drain valve in the transmission cover (1). Install a 12.7 mm (.50 inch) pipe with 1/2-14 NPTF threads into the valve.
- 2. Clamp a hose to the pipe in order to drain the oil into a suitable container.
- Open the drain valve and drain the oil into a suitable container.
- 4. Close the drain valve.
- Remove the hose and remove the pipe from the drains.
- Remove the bolts for the drain cover (2) and remove the drain cover(3). Remove the seal and remove the screen that is located behind the cover.
- Wash the screen in a clean, nonflammable solvent.
- **8.** Inspect the seal. If the seal is damaged, replace the seal.
- **9.** Install the screen, the seal, and the drain cover on the transmission.
- **10.** Clean the oil drain plug and install the oil drain plug.

#### **Suction Screen**

The suction screen for the power train is located below the cab.

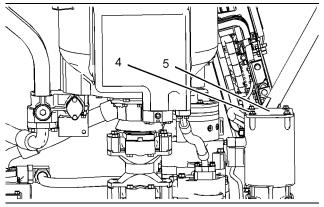


Illustration 275

g02161135

- 1. Remove the bolts (4) and remove the cover (5). Remove the screen that is located behind the housing.
- 2. Clean the screen in clean, nonflammable solvent.
- 3. Install the screen. Install the cover.
- **4.** Refill the transmission with oil. Refer to Operation and Maintenance Manual, "Power Train Oil Level Check" and Operation and Maintenance Manual, "Capacities Refill".

## **Pivot Shaft Oil Level - Check**

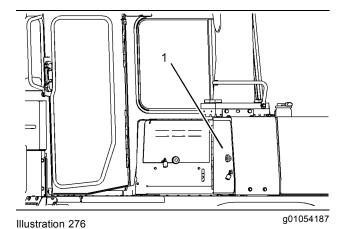
SMCS Code: 4153-535-FLV

## **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

**Note:** The initial fill of pivot shaft may trap air in the tube. The level of the oil may fall as air escapes. Barometric pressure and altitude changes may also cause the oil level to raise or lower. The reservoir must be filled several times in order to remain consistently full.



Open the access door on the left side of the cab (1).

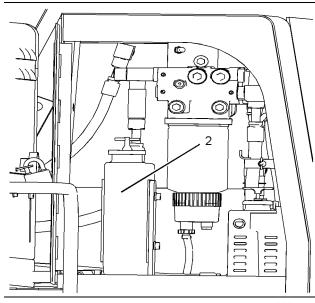


Illustration 277

g01154544

Maintain the oil within the limits of the dipstick for the oil reservoir (2). Do not overfill the oil reservoir. Hot oil can overflow the reservoir.

Remove the oil filler cap in order to add the oil to the oil reservoir.

## **Radiator Core - Clean**

SMCS Code: 1353-070; 1805-070; 1810-070

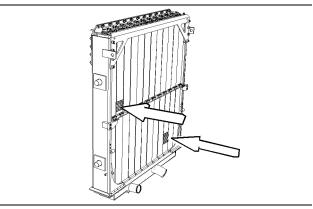


Illustration 278

g01307600

You can use compressed air, high pressure water, or steam to remove dust and other debris from the radiator core. However, the use of compressed air is preferred.

See Special Publication, SEBD0518, "Know Your Cooling System" for the complete procedure for cleaning the radiator core.

i02055608

# Radiator Pressure Cap - Clean/Replace

SMCS Code: 1353-070-Z2; 1353-510-Z2

### **WARNING**

Pressurized System: Hot coolant can cause serious burns. To open the cooling system filler cap, stop the engine and wait until the cooling system components are cool. Loosen the cooling system pressure cap slowly in order to relieve the pressure.

The radiator cap is located inside the access door on top of the engine enclosure on the left side.

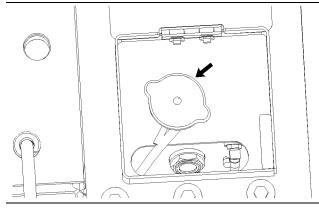


Illustration 279

g01048235

- Slowly remove the radiator cap in order to relieve system pressure.
- 2. Inspect the radiator cap for damage, for deposits, or for foreign material. Clean the radiator cap with a clean cloth. Replace the radiator cap if the radiator cap is damaged.
- 3. Install the radiator cap.

i02055619

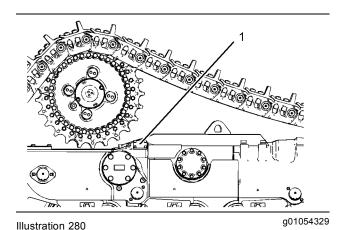
# Recoil Spring Compartment Oil Level - Check

SMCS Code: 4158-535-OC

## **A WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.



1. Remove all of the debris around the cover plate (1) on the top of the track roller frame.

Remove the cover plate for the oil filler. The dipstick (2) is part of the cover plate.

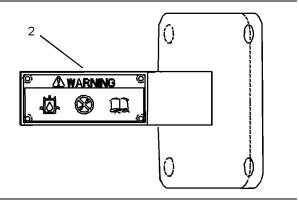


Illustration 281

g01054336

- Maintain the oil level above the MIN mark on the dipstick.
- 4. Install the cover plate.
- **5.** Repeat the procedure for the other recoil compartment.

i03642341

# Refrigerant Dryer - Replace (If Equipped)

**SMCS Code:** 7322-510; 7322-535

### **WARNING**

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

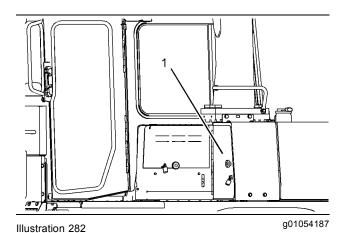
Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.



The in-line dryer is located on left hand side of the machine in the compartment (1) with the fuel filters.

The in-line dryer is accessible by opening the door to the compartment.



Illustration 283 g01017640

**Note:** The "R-134a" refrigerant dryer should be replaced annually. Extremely humid operating conditions may require more frequent replacement of the dryer. The dryer should also be replaced if the air conditioning system has been leaking or if the system has been opened for service repair.

**Reference:** For the correct procedure, refer to Air Conditioning and Heating Service Manual, SENR5664 or the Disassembly and Assembly Manual for your machine.

**Note:** A qualified mechanic should replace the components of the refrigerant system since special tooling and training are required.

i02039230

# Ripper Linkage and Cylinder Bearings - Lubricate

SMCS Code: 6313-086-BD, L4

**Note:** There are a total of twelve grease fittings for the ripper linkage and hydraulic cylinder bearings.

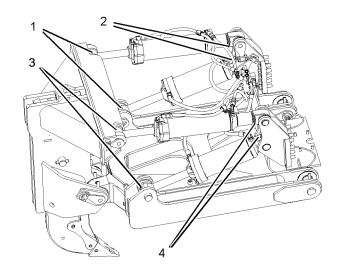


Illustration 284 g01048827

Lubricate the grease fittings for the hydraulic cylinder bearings (1), (2), (3) and (4).

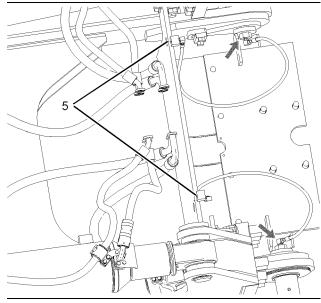


Illustration 285 g01048866

Lubricate the remote grease fittings for the pins (5).

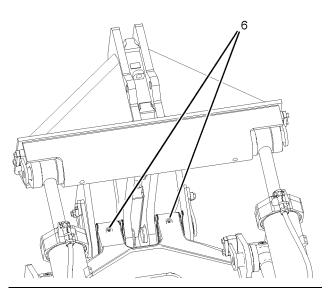


Illustration 286 g01048879

Lubricate the grease fittings for the pins (6).

i02039171

# Ripper Tip and Shank Protector - Inspect/Replace (If Equipped)

**SMCS Code:** 6808-040; 6808-510; 6810; 6812-040; 6812-510

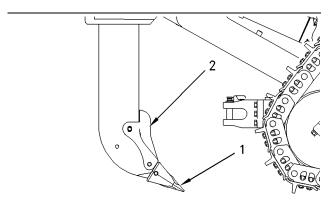


Illustration 287

g00945595

- (1) Ripper tip
- (2) Shank protector

When the ripper tip is worn close to the shank, replace the ripper tip. When the shank protector is worn close to the shank, replace the shank protector. If the tip is too blunt, the tip will not penetrate properly.

- Raise the ripper. Place blocking under the ripper. Lower the ripper onto the blocking. The ripper should be high enough so that the ripper tip or the shank protector can be removed. Do not place the ripper too high.
- 2. If the ripper tip is worn, drive out the pin. Remove the tip and the shank pin retainer.
- 3. Clean the shank pin retainer and the pin.
- 4. Install the new tip and the retainer.
- Install the pin from the opposite side of the retainer.
- **6.** If the shank protector is worn, drive out the pins. Remove the shank protector.
- 7. Clean the pin retainers and the pins.
- **8.** Install the new shank protector and the retainers.
- **9.** Install the pins from the opposite side of the retainer.
- 10. Raise the ripper and remove the blocking.
- 11. Lower the ripper to the ground.

i03130720

# Rollover Protective Structure (ROPS) - Inspect

**SMCS Code:** 7325-040

**Note:** The ROPS arrangement typically consists of the following components: ROPS assembly (1) (canopy) with upper mounting bolts (A) and ROPS support assembly (2) with lower mounting bolts (B). See Illustration 288.

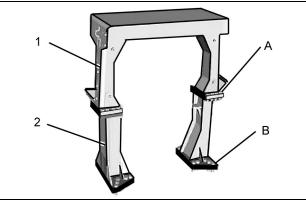


Illustration 288

g01609177

(1) Rollover Protective Structure (ROPS)

Inspect the ROPS arrangement, the canopy, and lower supports for any cracks or damage. If the ROPS has any cracks in the welds, in the castings, or in any metal section, consult your Caterpillar dealer for repairs.

**Reference:** See Special Instruction, SEBU6929, "Inspection, Maintenance and Repair of Rollover Protective Strructures (ROPS) and Attachment Installation Guidelines" for further guidance information.

Inspect both sides of the Rollover Protective Structure (ROPS) for bolts that are loose, broken or damaged. If any broken ROPS bolts (A) or (B) are found, replace all of ROPS bolts (A) or (B).

Inspect the Rollover Protective Structure (ROPS) for bolts that are loose or damaged. Replace any damaged bolts and any missing bolts with original replacement parts only.

Do not weld reinforcement plates to the ROPS in order to straighten the ROPS. Do not weld reinforcement plates to the ROPS in order to repair the ROPS.

**Note:** Notify your Caterpillar dealer if broken bolts are found.

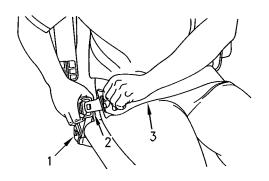
**Reference:** See "Specifications" in the Service Manual for information on the bolt torque, if necessary.

i02429589

## Seat Belt - Inspect

SMCS Code: 7327-040

Always check the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.



g00932801

Check the seat belt mounting hardware (1) for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

Check buckle (2) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect the seat belt (3) for webbing that is worn or frayed. Replace the seat belt if the seat belt is worn or frayed.

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

**Note:** Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

i02429594

# Seat Belt - Replace

**SMCS Code:** 7327-510

Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt . Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

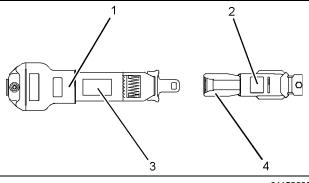


Illustration 290

g01152685

- (1) Date of installation (retractor)
- (2) Date of installation (buckle)
- (3) Date of manufacture (tag) (fully extended web)
- (4) Date of manufacture (underside) (buckle)

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware. If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i03967449

# enge

# Torque Converter Scavenge Screen - Clean

**SMCS Code:** 3101-070-MGS

## **MARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

After a major power train component failure, clean the torque converter scavenge screen.

1. Remove the bottom guard in order to gain access to the torque converter.

Note: Drain all fluids into a suitable container.

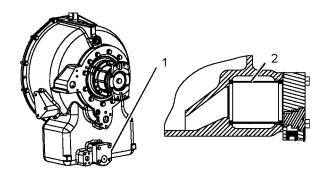


Illustration 291 g01387611

- 2. Remove the bolts and drain valve body (1) from the torque converter, as shown.
- **3.** Remove torque converter scavenge screen (2) from the torque converter housing.
- Wash the screen in a clean, nonflammable solvent.
- **5.** Install torque converter scavenge screen (2) in the torque converter housing. Install the bolts and drain valve body (1).
- 6. Install the bottom guard.

**Reference:** See Operation and Maintenance Manual, "Power Train System Oil Level - Check" in order to fill with oil.

i03678988

## Track - Check/Adjust

SMCS Code: 4170-036

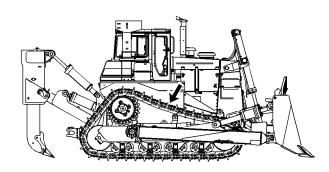


Illustration 292

g01048969

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

### **A WARNING**

Grease is under high pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve only one turn.

- Move the machine forward. Allow the machine to coast to a stop without the use of the service brakes. Adjust the tracks while you are in the machine's typical operating conditions. If packing conditions prevail on the workplace, the tracks should be adjusted with packing material.
- 2. To measure the sag in the track, stretch a string over the grousers that are between the sprocket and the front idler. Take the measurement from the string to the top of the grouser at the maximum measurement. Dimension (2) is the maximum distance between the string and the grouser.

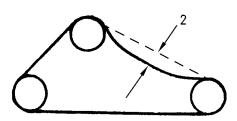


Illustration 293 g00512026

Track adjustment without carrier rollers

If a machine does not have carrier rollers, the sag in the track is measured between the sprocket and the front idler. The correct adjustment of dimension (2) is  $155 \pm 10$  mm (6.1  $\pm$  .40 inch).

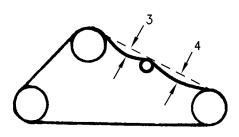


Illustration 294 g00511982

Track adjustment with carrier rollers

If the machine is equipped with a carrier roller, the correct adjustment of dimension (3) and dimension (4) is  $75 \pm 10$  mm ( $3 \pm 0.40$  inch).

**Note:** The sum of dimension (3) and dimension (4) must be  $155 \pm 10$  mm (6.1  $\pm 0.40$  inch).

## **Loose Track Adjustment**

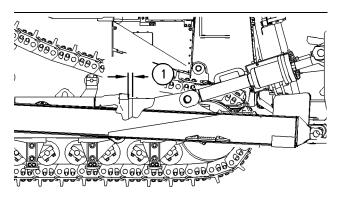


Illustration 295

g00945693

Location of dimension (1)

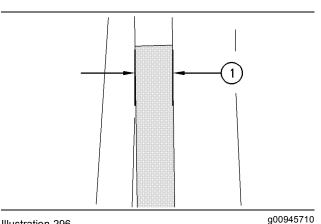


Illustration 296

Dimension (1)

#### **NOTICE**

Do not attempt to tighten track when dimension (1) is 193 mm (7.6 inch) or more.

Contact your Caterpillar dealer for track service or instructions.

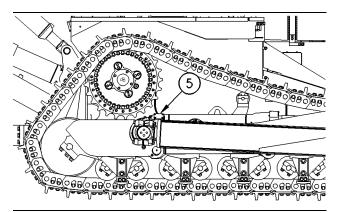


Illustration 297

g00945717

1. Remove access cover (5).

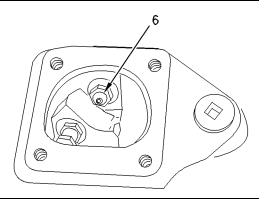


Illustration 298 g00945711

- 2. Add multipurpose grease (MPGM) through track adjustment valve (6). Add the MPGM until dimension (2) is correct.
- **3.** Operate the machine back and forth in order to equalize the pressure. Allow the machine to coast to a complete stop. Do not use the brakes.
- 4. Remeasure dimension (2).
- 5. Install access cover (5).

## **Tight Track Adjustment**

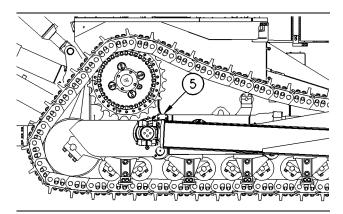


Illustration 299 g00945717

1. Remove access cover (5).

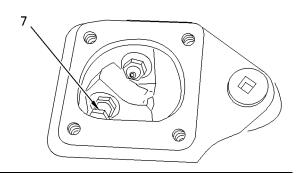


Illustration 300 g00945714

- **2.** Loosen relief valve (7) by one turn of 360 degrees. Allow the grease to escape.
- 3. Close the relief valve.

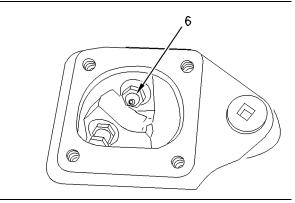


Illustration 301

g00945711

- **4.** Add MPGM through track adjustment valve (6). Add grease until dimension (2) is correct.
- 5. Install access cover (5).

## **Bolt Torque for Track Shoes**

The torque requirement for track shoe bolts is  $870 \pm 70 \text{ N} \cdot \text{m}$  (642 ± 50 lb ft). Tighten the bolts for an additional 120 degrees. If you are using bolts with a master link, tighten the bolts to a torque of  $870 \pm 90 \text{ N} \cdot \text{m}$  (642 ± 66 lb ft). Then, tighten the bolts for an additional 120 degrees.

## **Track Pins - Inspect**

SMCS Code: 4175-040-PN

### **A** WARNING

Fingers can be burned from hot pins and bushings.

The pins and bushings in a dry joint can become very hot. It is possible to burn the fingers if there is more than brief contact with these components.

Use the recommendations in order to extend the life of the undercarriage. Use the recommendations in order to avoid excessive downtime.

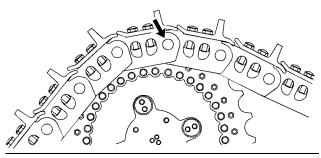


Illustration 302

g01048998

- During the machine operation, listen for unusual squeaking and for unusual squealing. This can indicate a dry joint.
- 2. Check the machine for dry joints weekly. Check for dry joints immediately after machine operation. After machine operation, lightly touch the end of each track pin or bushing. Touch the track pin or the track bushing with the back of your hand. Make a mark on any dry track pin joint that is very hot to the touch.
- **3.** Do not hit the ends of the track pins with a sledge hammer in order to loosen the track joints.

#### NOTICE

Striking the end of a track pin introduces a significant amount of end play into the track joint and can result in early failures.

Consult your Caterpillar dealer's Custom Track Service expert if you detect dry joints or leaks. Your Caterpillar dealer's Custom Track Service expert can perform track inspection. i02039992

## **Track Roller Frame - Inspect**

SMCS Code: 4151-040

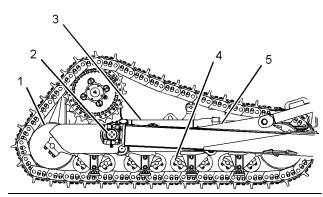


Illustration 303

q01049034

Inspect the track roller frame (3) for leaks. Check the seal for the pivot shaft (2) for oil leaks. Check the idlers (1) and track rollers (4) for leaks. Inspect the seal for the recoil spring (5) for oil leaks.

i02040024

## Track Roller Frame Guides - Inspect

**SMCS Code:** 4177-040

Measure the rotational movement of the front roller frame relative to the rear roller frame.

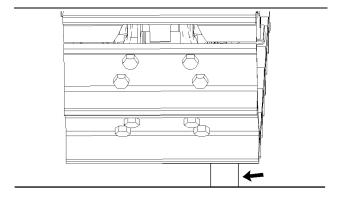
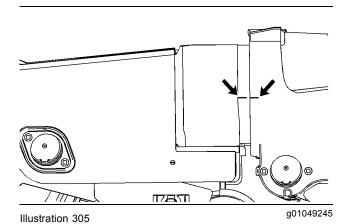


Illustration 304

g01049094

 Raise the front of the machine with the hydraulics of the dozer. Place a 100 mm (4 inch) block under the outside edge of a track shoe. Place the block near the track idler. Lower the machine onto the block.



Use a grease pencil to make a mark on the tubular section of the front roller frame. Make a mark on the rear of the roller frame. This mark should correspond with the mark that is on the tubular section.

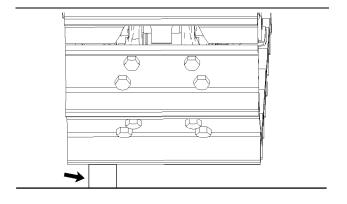


Illustration 306

g01049226

Raise the front of the machine with the hydraulics of the dozer. Place the block under the inside edge of the same track shoe. Lower the machine onto the block.

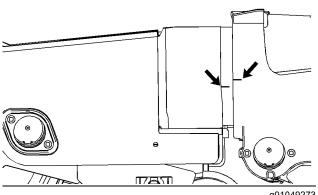


Illustration 307 g01049273

**4.** Measure the distance between the two marks on the front roller frame. If the distance between the two marks is greater than 4.5 mm (0.18 inch), inspect the track roller frame guides for wear.

Repeat the entire procedure for the other side of the machine.

#### NOTICE

Never build up the track roller frame guides with hardface welding. This will cause serious wear damage to the guide slots in the front track roller frame.

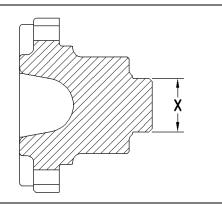


Illustration 308

g00781090

Track Roller Frame Guide

If dimension (X) is less than 45.3 mm (1.78 inch), replace the track roller frame guides.

**Reference:** Refer to Disassembly and Assembly, "Front Track Roller Frame - Remove" and refer to Disassembly and Assembly, "Front Track Roller Frame - Install" in the Service Manual for your machine. Also, consult your Caterpillar dealer for more information or for service.

i03409088

## Walk-Around Inspection

**SMCS Code:** 7000-040

**Reference:** See Operation and Maintenance Manual, "Daily Inspection" for more information.

i02775471

# Winch Fairlead Rollers - Lubricate

**SMCS Code:** 5163-086

If equipped:

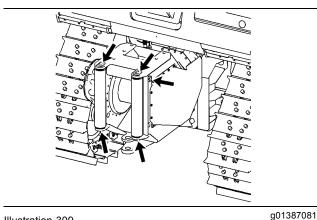


Illustration 309

Lubricate the five fittings. Use MPGM Grease.

i02775441

## Winch Oil Level - Check

SMCS Code: 5163-535-FLV

If equipped:

### **PA140VS**

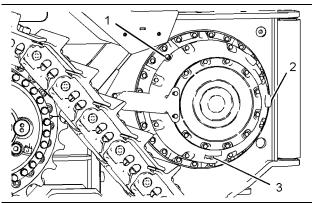


Illustration 310

g01387065

- 1. Remove the oil level plug (2) in order to check the oil level. The oil level should be maintained to the bottom of the level plug hole.
- 2. If necessary, remove oil filler plug (1) and add oil.

Check for oil leaks around the covers and around the hoses. Repair any oil leaks.

# Winch Wire Rope - Install (If Equipped)

SMCS Code: 5154-012; 5163-012

### WARNING

Personal injury or death can result from worn wire rope cable.

Worn or frayed cable could break causing injury.

Check the wire rope cable. If cable is worn or is frayed install a new cable.

### **PA140VS**

The cable is attached to the drum on the winch with a cable ferrule. The ferrule is placed into a socket on the drum.

Use the following table to order the cable.

Table 23

Wire Cable		
Wire Rope Diameter	Recommended Ferrule	Holding Capacity
25 mm (1 inch)	L-8	91 m (300 ft)
29 mm (1.13 inch)	J-9	84 m (276 ft)
32 mm (1.25 inch)	J-10	59 m (193 ft)

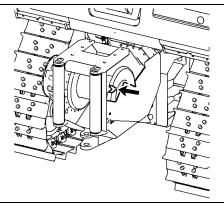


Illustration 311

g01076208

- **1.** Put the cable in a straight line behind the tractor.
- 2. Install the ferrule end into the socket.
- 3. Reel in the cable.

# Window Washer Reservoir - Fill

SMCS Code: 7306-544

#### NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.

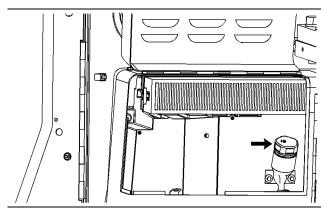


Illustration 312

g01049872

The washer fluid bottle is on the left side of the machine above the battery box. Remove the fluid bottle cap in order to fill the washer fluid bottle.

i02039002

# Window Wipers - Inspect/Replace

SMCS Code: 7305-040; 7305-510

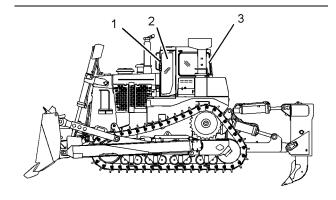


Illustration 313

g01058605

- (1) Front window wiper
- (2) Side window wiper
- (3) Rear window wiper

Inspect the front window wiper blade, the side window wiper blades and the rear window wiper blade.
Replace any wiper blades that are damaged or worn.
Replace any wiper blades that streak the window.

i03131127

## Windows - Clean

SMCS Code: 7310-070; 7340-070

#### If equipped:

Use commercially available window cleaning solutions to clean the windows.

To clean the outside of the rear window from the inside of the cab, remove the sliding section of the rear window. Use the following procedure in order to remove the sliding section of the rear window.

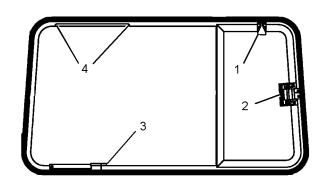


Illustration 314

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- 1. Lift latch (1) in order to slide the small window. Squeeze latch (2) in order to move the window from the CLOSED position.
- 2. Move handle stop (3) to the UP position. To move the handle stop to the UP position, lift the handle and rotate the handle simultaneously. Rotate the handle until the handle is vertical.
- **3.** Move the small section of the window to opening (4) in the upper window channel.
- Tilt the top of the window toward the inside of the cab. Remove the window.
- **5.** Stay inside the cab in order to clean the outside of the rear window.
- **6.** After cleaning, install the sliding section of the rear window.

## **Cleaning From Ground Level**

**Note:** Use the following method in order to clean a solid rear window.

Use commercially available window cleaning solutions in order to clean the windows. Clean the outside of the windows from the groundor with the use of a man lift, unless appropriate handholds are available.

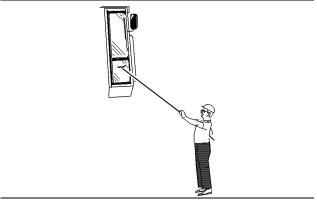


Illustration 315
Typical example

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Use a pole with a squeegee in order to reach the high areas of the window.